Computer Science

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PYTHON REVISION TOUR

ABOUT PYTHON:

1. Python is a high-level programming language developed by Guido Van Rossum. The language was released in February 1991 and got its name from a BBC comedy series "Monty Python's Flying Circus".
2. It is an interpreted and platform independent language i.e. the same code can run on any operating system.
3. It can be used to follow both procedural and object-oriented approaches to programming.
4. It is free to use and based on two programming languages: ABC language and Modula-3.

BASIC TERMS USED IN PYTHON:

1. **Token / Lexical Unit:** The smallest individual unit in a python program is known as Token or Lexical Unit. A token has a specific meaning for a python interpreter. Examples of tokens are: Keywords, Identifiers, Literals, Operators and Punctuators.
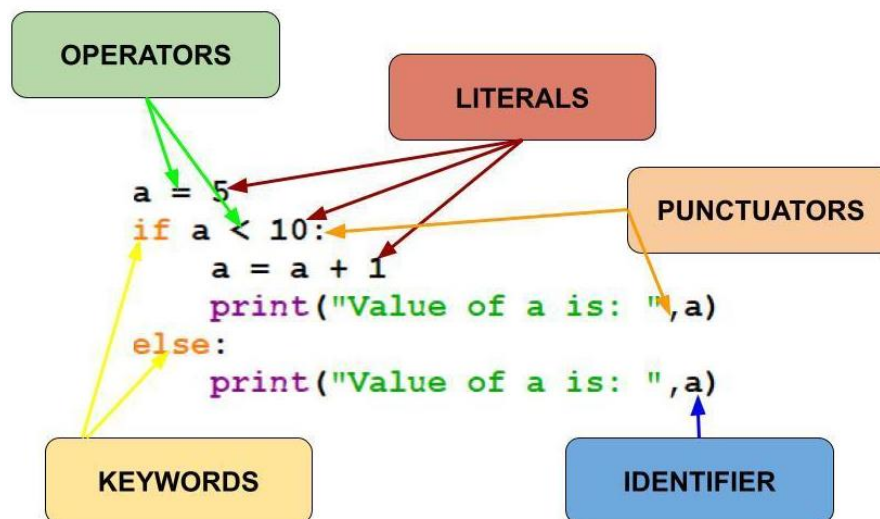
2. **Keywords:** Keywords are the reserved words and have special meaning for Python Interpreters. Each keyword can be used only for that purpose which it has been assigned. Examples: and, while, del, with, True, None, False, return, try etc.

3. **Identifiers:** These are the names given to variables, objects, classes or functions etc. there are some predefined rules for forming identifiers which should be followed else the program will raise Syntax Error.

4. **Literals:** The data items that have a fixed value are called Literals. If a data item holds numeric values it will be known as Numeric Literal, if it contains String values it will be known as String Literal and so on. It means the type of value stored by the data item will decide the type of Literal. Python has one special literal which is None to indicate absence of value.

5. **Operators:** These are the symbols that perform specific operations on some variables. Operators operate on operands. Some operators require two operands and some require only one operand to operate. The operator precedence in Python is as follows:

Operator	Description	
( )	Parentheses (grouping)	Highest
**	Exponentiation	
~x	Bitwise nor	
+x,-x	Positive , negative (unary +,-)	
*,/,//,%	Multiplication , division , floor division , remainder	
+,-	Addition , subtraction	
&	Bitwise and	
^	Bitwise XOR	
|	Bitwise OR	
<,<=,>,>=,<>,!=,== ,is,isnot	Comparisons (Relational operators),identity operators	
not x	Boolean NOT	
And	Boolean AND	
or	Boolean OR	Lowest

NOTE: When we compare two variables pointing to same value, then both Equality (==) and identity (is) will return True. But when same value is assigned to different objects, then == operator will return True and is operator will return False.

6. **Punctuators:** These are the symbols that are used to organize sentence structure in programming languages. Common punctuators are: ' " # $ @ [] {} = : ; () , .

7. **Variables:** In Python, variables are not storage containers like other programming languages. These are the temporary memory locations used to store values which will be used in the program further. Each time we assign a new value to a variable it will point to a new memory location where the assigned value is stored. In Python we do not specify the size and type of variable, besides these are decided as per the value we assign to that variable.

8. **Data Type:** It specifies the type of data we will store in the variable according to which memory will be allocated to that variable and it will also specify the type of operations that can be performed on that variable. Examples: integer, string, float, list etc.

9. **Dynamic Typing:** It means that it will be decided at the run time that which type of value the variable will store. It is also called implicit conversion. For example,

```
a = 'hello'     #a is of string type
a = 12          #a is of integer type
a = 12.56       # a is of float type
b = 10
c = a + b
a
12.56
b
10
c
22.56000000000002
```

Here, we need not to specify the type of value a will store besides we can assign any type of value to a directly. Similarly, the data type of **c** will be decided at run time on the basis of value of **a** and **b.**

10. **Type Casting:** In Type casting, the data type conversion of a variable is done explicitly by using some built-in functions. Here, we can say that we force the variable by applying a built-in function to change the data type and it is not done at run time. Some common type casting functions are int(), float(), str(), list(), tuple(), dict() etc.

```
a = 12      #a is of integer type
b = float(a)    #changing a from integer to float
b    #now b will contain float value of a
12.0

t = (1,2,3,4)
s = list(t)
s
[1, 2, 3, 4]
```

DATA TYPES IN PYTHON:
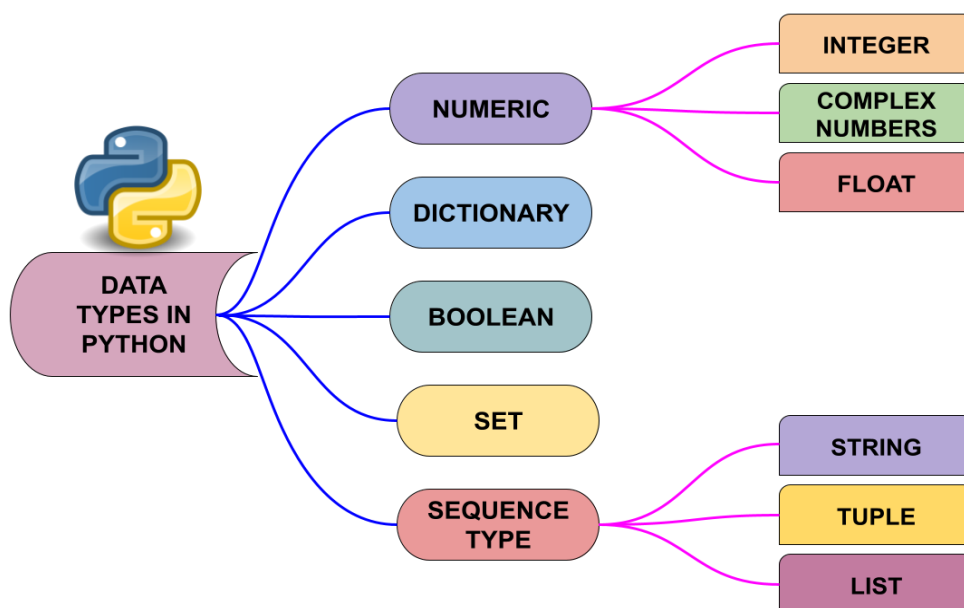
Above data types are classified in two basic categories: Mutable data types and Immutable data types. **Mutable data types** are those data types whose value can be changed without creating a new object. It means mutable data types hold a specific memory location and changes are made directly to that memory location. **Immutable data types** are those data types whose value cannot be changed after they are created. It means that if we make any change in the immutable data object then it will be assigned a new memory location.

1. In **Numeric data types**, Integers allow storing whole numbers only which can be positive or negative. Floating point numbers are used for storing numbers having fractional parts like temperature, area etc. In Python, Floating point numbers represent double precision i.e. 15-digit precision. Complex numbers are stored in python in the form of A + Bj where A is the real part and B is the imaginary part of complex numbers.

2. **Dictionary** is an unordered set of comma separated values where each value is a **key:value** pair. We represent the dictionary using curly brackets {}. Keys in the dictionary should be unique and they cannot be changed while values of the keys can be changed.

3. **Boolean** allows to store only two values True and False where True means 1 and False means 0 internally.

4. **Sequence data types** store a collection or set of values in an ordered manner. We can traverse the values/elements using indexing. The sequence data types are:

A. <u>STRING:</u>

- In Python, string is a sequence having Unicode characters. Any value written/assigned in " " or ' ' is considered as a string in python.
- Each character is at a particular place called Index having starting value 0 if traversing forward. Indexing can also be done in backward direction starting from the last element/character of string where starting value will be -1 in backward direction.
- Strings are immutable.
- Joining operation in a string can be done between two strings only. We cannot join a number and a string using '+'.
- Concatenation operation in a string can be done between a string and a number only using '*'.
- Slicing is defined as extracting a part of string from the main string using unique index positions starting from 0. In slicing we can specify start, stop and step values to extract substring from the given string.
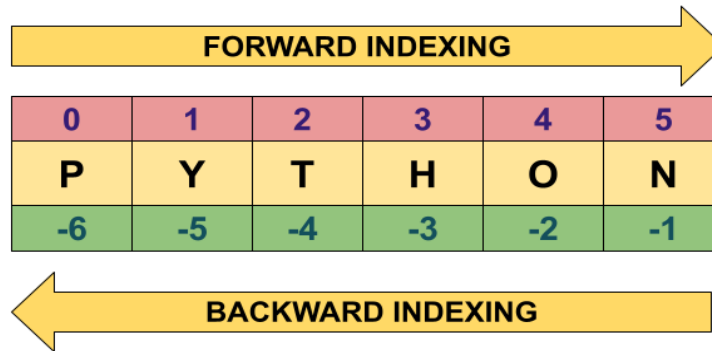
B. LIST:

- Lists can hold multiple elements of the same or different data types.
- Lists are mutable in nature which means the values can be updated without assigning a new memory location. It is denoted by square brackets [].
- 'for' loop can be used to traverse a list.
- We can add (join) a list with another list only and not with int, float or string type. Joining of 2 or more can be done using '+'.
- We can concatenate a list with an integer only. Concatenation (Replication) can be done in a list using '*'.
- Slicing means extracting a part of list. Slicing in a list is done in same way as in String.

C. TUPLE:

- Tuples can also hold multiple elements of the same or different data types like lists but tuples are immutable in nature. These are denoted by round brackets ().
- If multiple values are assigned to a single variable then by default the type of variable will be tuple.
- Tuples can be traversed in same way as Strings using 'for' loop.
- Slicing, Concatenation (Replication) and Joining operations can also be performed on Tuples in same way as of Strings.

WIDELY USED BUILT-IN FUNCTIONS IN PYTHON:

STRING FUNCTIONS:

len (string)	It returns the number of characters in any string including spaces.
capitalize()	It is used to convert the first letter of sentences in capital letter.
title()	It is used to convert first letter of every word in string in capital letters.
upper()	It is used to convert the entire string in capital case letters.
lower()	It is used to convert entire string in small case letters.
count(substring, [start], [end])	It is used to find the number of occurrences of substring in a string. We can also specify starting and ending index to specify a range for searching substring.
find(substring, [start],[end])	This function returns the starting index position of substring in the given string. Like count(), we can specify the range for searching using starting and ending index. **It returns -1 if substring not found.**
index(substring)	It returns the starting index position of substring. If substring not found then it will return an error **"Substring not found".**
isalnum()	It is used to check if all the elements in the string are alphanumeric or not. It returns either True or False.
islower()	It returns True if all the elements in string are in lower case, otherwise returns False.
isupper()	It returns True if all the elements in string are in upper case, otherwise returns False.
isspace()	It returns True if all the elements in string are spaces, otherwise returns False.
isalpha()	It returns True if all the elements in string are alphabets, otherwise returns False.
isdigit()	It returns True if all the elements in string are digits, otherwise returns False.
split([sep])	This function is used to split the string based on delimiter/separator value which is space by default. It returns a list of n elements where the value of n is based on delimiter. The delimiter is not included in the output.
partition(sep)	It divides the string in three parts: head, separator and tail, based on the **sep** value which acts as a delimiter in this function. It will always return a tuple of 3 elements. The delimiter/separator will be included as 2nd element of tuple in the output.
replace(old, new)	It is used to replace old substring inside the string with a new value.
strip([chars])	It returns a copy of string after removing leading and trailing white spaces by default. We can also provide **chars** value if we want to remove characters instead of spaces. If **chars** is given then all possible combination of given characters will be checked and removed.
lstrip([chars])	It returns a copy of string after removing leading white spaces. If **chars** value is given then characters will be removed.
rstrip([chars])	It returns a copy of string after removing trailing white spaces. If **chars** value is given then characters will be removed.

LIST FUNCTIONS:

index()	Used to get the index of first matched item from the list. It returns index value of item to search. If item not found, it will return ValueError: n is not in the list.
append()	Used to add items to the end of the list. It will add the new item but not return any value
extend()	Used for adding multiple items. With extend we can add multiple elements but only in form of a list to any list. Even if we want to add single element it will be passed as an element of a list.
insert()	Used to add elements to list at position of our choice i.e. we can add new element anywhere in the list.
pop()	Used to remove item from list. It raises an exception if the list is already empty. By default, last item will be deleted from list. If index is provided then the given indexed value will be deleted.
remove()	Used to remove an element when index is not known and we want to delete by provided the element value itself. It will remove first occurrence of given item from list and return error if there is no such item in the list. It will not return any value.
clear()	Use to remove all the items of a list at once and list will become empty.
Del	del statement is used to delete the structure of existing list.
count()	Used to count the number of occurrences of the item we passed as argument. If item does not exist in list, it returns Zero.
reverse()	Used to reverse the items of a list. It made the changes in the original list and does not return anything.
sort()	Used to sort the items of a list. It made the changes in the original list and sort the items in increasing order by default. We can specify reverse argument as True to sort in decreasing order.
sorted()	Used to sort the items of a **sequence data type** and returns a list after sorting in increasing order by default. We can specify reverse argument as True to sort in decreasing order.

TUPLE FUNCTIONS:

len()	Returns number of elements in a tuple
max()	Returns the element having maximum value in the tuple
min()	Returns the element having minimum value
index()	Returns index value of given element in the tuple. It item doesn't exist, it will raise ValueError exception.
count()	It returns the number of occurrences of the item passed as an argument. If not found, it returns Zero.

sorted()	Used to sort the items of a **sequence data type** and returns a list after sorting in increasing order by default. We can specify reverse argument as True to sort in decreasing order.

Dictionary Functions:

clear()	Used to remove all items from dictionary
get()	Used to access the value of given key, if key not found it raises an exception.
items()	Used to return all the items of a dictionary in form of tuples.
keys()	Used to return all the keys in the dictionary as a sequence of keys.
values()	Used to return all the values in the dictionary as a sequence of values.
update()	Merges the key:value pair from the new dictionary into original dictionary. The key:value pairs will be added to the original dictionary, if any key already exists, the new value will be updated for that key.
fromkeys()	Returns new dictionary with the given set of elements as the keys of the dictionary.
copy()	It will create a copy of dictionary.
popitem()	Used to remove the last added dictionary item (key:value pair)
max()	Used to return highest value in dictionary, this will work only if all the values in dictionary are of numeric type.
min()	Used to return lowest value in dictionary, this will work only if all the values in dictionary are of numeric type.
sorted()	Used to sort the key:value pair of dictionary in either ascending or descending order based on the keys.

Statements in Python:

Instructions given to computer to perform any task are called Statements. In Python, we have 3 type of statements:

- **EMPTY STATEMENTS:** When a statement is required as per syntax but we don't want to execute anything or do not want to take any action we use *pass* keyword. Whenever *pass* is encountered, python interpreter will do nothing and control will move to the next statement in flow of control.
- **SIMPLE STATEMENT:** All the single executable statements in Python are Simple Statements.
- **COMPOUND STATEMENTS:** A group of statements executed as a unit are called compound statements. Compound statements has a Header which begins with a

keyword and ends with colon (:). There can be at least one or more statements in the body of the compound statement, all indented at same level.

Conditional statements in Python:

When the execution of any statement depends on some condition then such statements are considered as Conditional Statements. In Python, we use *if* keyword for Conditional statements.
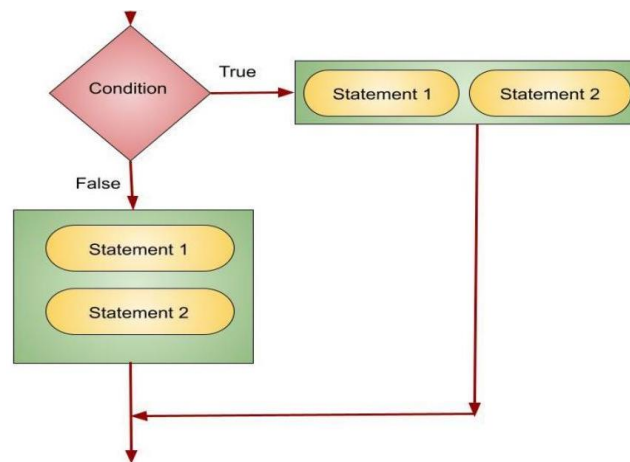
- It must contain valid condition which evaluates to either True or False.
- Condition must follow by Colon (:), it is mandatory.
- Statement inside if must be at same indentation level.
- if statement can be of many forms:
  - if without false statement
  - if with else
  - if with elif
  - Nested if

Iterative statements in Python:

In Python, to perform repetition we have two keywords, *for* (Counting Loop) and *while* (Conditional Loop)
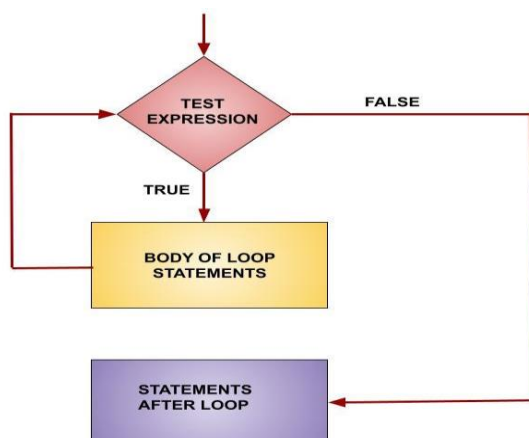
- *for* loop in python is used when we know the number of iterations.
- *for* loop is used to create loop where we are working on sequence data types.
- To repeat the loop **n number of times** in *for* loop we use range function in which we can specify lower limit and upper limit.
- **range function** will generate set of values from lower limit to upper limit. We can also specify the step value which is +1 by default.
- Step value can be in -ve also to generate set of numbers in reverse orders.
- *while* loop in python is also called as entry-controlled loop in which entry is loop is allowed only if the condition is true.
- There are 4 main elements of *while* loop:

  - **Initialization:** In while loop, we cannot use a variable in test condition without initializing it with a starting value. So, we will specify the starting value to the variable to be used in loop.

  - **Test Condition:** We will specify a test condition in the header of the loop. If this condition will be True then only the body of the loop will be executed else the loop will not get executed at all.

  - **Body of loop:** We will write the statements to be executed if the test condition will be True.

  - **Update Statement:** In while loop, we have to increase and decrease the value of variable used in test condition else the loop will result in infinite loop.

- **break** keyword is used to take control out of the loop for any given condition. When *break* is encountered in a loop the flow of control jumps to the very next statement after the loop.
- **continue** keyword is used to skip the execution of remaining statements inside the loop and takes control to next iteration..

MULTIPLE CHOICE QUESTION

1   Find the invalid identifier from the following
          a) None
          b) address
          c) Name
          d) pass

2   Write the type of tokens from the following:
          a) If
          b) roll_no

3   Consider a declaration L = (1, 'Python', '3.14').
       Which of the following represents the data type of L?
          a) List
          b) Tuple
          c) Dictionary
          d) String

4   Identify the valid arithmetic operator in Python from the following.
          a) ?
          b) <
          c) **
          d) And

5   Which of the following statements is/are not python keywords?
          a) False
          b) Math
          c) WHILE
          d) Break

6   Which of the following is a valid keyword in Python?
          a) False
          b) return
          c) non_local
          d) none

7   State True or False.
       "Identifiers are names used to identify a variable, function in a program".

8   Identify the invalid identifier out of the options given below.
          a) Qwer_12
          b) IF
          c) Play123
          d) Turn.over

9   One of the following statements will raise error. Identify the statement that will raise the error.

a) `>>> x,y=20`
b) `|>>>|a,b=6,7*9`
c) `>>>|a=b=c=35`
d) None of above will raise error

10   Given the following Tuple
Tup (10, 20, 30, 50)
Which of the following statements will result in an error?
   a) print (Tup [0])
   b) print (Tup [1:2])
   c) Tup.insert (2,3)
   d) print(len (Tup))

11   Consider the given expression : 5<10 and 12>7 or not 7>4
Which of the following will be the correct output, if the given expression is evaluated?
   a) True
   b) False
   c) NULL
   d) NONE

12   Which of the following will give output as [5,14,6] if lst=[1,5,9,14,2,6]?
   a)   print(lst[0::2])
   b)   print(lst[1::2])
   c)   print(lst[1:5:2])
   d)   print(lst[0:6:2])

13   The return type of the input() function is
   a) string
   b) Integer
   c) list
   d) tuple

14   Which of the following operator cannot be used with string data type?
   a) +
   b) In
   c) *
   d) /

15   Consider a tuple tup1 = (10, 15, 25, and 30). Identify the statement that will result in an error.
   a) print(tup1[2])
   b) tup1[2] = 20
   c) print(min(tup1))
   d) print(len(tup1))

16   Which one of the following is the default extension of a Python file?
   a) .exe
   b) .p++

c) .py

d) .p

17 Which of the following symbol is used in Python for single line comment?
    a) /
    b) /*
    c) //
    d) #

18 Which of these about a dictionary is false?
    a) The values of a dictionary can be accessed using keys
    b) The keys of a dictionary can be accessed using values
    c) Dictionaries aren't ordered
    d) Dictionaries are mutable

19 Which is the correct form of declaration of dictionary?
    a) Day={1:'monday',2:'tuesday',3:'wednesday'}
    b) Day=(1;'monday',2;'tuesday',3;'wednesday')
    c) Day=[1:'monday',2:'tuesday',3:'wednesday']
    d) Day={1'monday',2'tuesday',3'wednesday']

20 What will be the output of the following statement:
print(3-2**2**3+99/11)
    a) 244
    b) 244.0
    c) -244.0
    d) Error

21 What is the output of following code:
T=(100) print(T*2)
    a) Syntax error
    b) (200,)
    c) 200
    d) (100,100)

22 Identify the output of the following Python statements:
x = [[10.0, 11.0, 12.0],[13.0, 14.0, 15.0]] y = x[1][2] print(y)
    a) 12.0
    b) 13.0
    c) 14.0
    d) 15.0

23 Select the correct output of the code :
S= "Amrit Mahotsav @ 75" A=S.partition (" ") print (a)
    a) ('Amrit Mahotsav', '@', '75')
    b) ['Amrit', 'Mahotsav', '@', '75']
    c) ('Amrit', 'Mahotsav @ 75')
    d) ('Amrit', '', 'Mahotsav @ 75')

24   Identify the output of the following Python statements.
      x = 2
       while x < 9:
              print(x, end='')
            x = x + 1
          a) 12345678
          b) 123456789
          c) 2345678
          d) 23456789

25   Identify the output of the following Python statements.
      b = 1
      for a in range(1, 10, 2):
          b += a + 2
          print(b)
          a) 31
          b) 33
          c) 36
          d) 39

26   A tuple is declared as T = (2,5,6,9,8). What will be the value of sum(T)?

27   Identify the output of the following Python statements.
      lst1 = [10, 15, 20, 25, 30]
      lst1.insert(3, 4)
      lst1.insert(2, 3)
      print (lst1[-5])
          a) 2
          b) 3
          c) 4
          d) 20

28   Evaluate the following expression and identify the correct answer.
       16 - (4 + 2) * 5 + 2**3 * 4
          a) 54
          b) 46
          c) 18
          d) 32

29   Fill in the blank.
                      _function is used to arrange the elements of a list in ascending
      order.
          a) sort()
          b) ascending()
          c) arrange()
          d) asort()

30   Which of the following will delete key-value pair for key = "Red" from a dictionary D1?
      a) delete D1("Red")
      b) del D1["Red"]
      c) del.D1["Red"]
      d) D1.del["Red"]

31   Identify the valid declaration of L: L = ['Mon', '23', 'hello', '60.5']
      a) dictionary
      b) string
      c) tuple
      d) list

32   Given a Tuple tup1= (10, 20, 30, 40, 50, 60, 70, 80, 90).
What will be the output of print (tup1 [3:7:2])?
      a) (40,50,60,70,80)
      b) (40,50,60,70)
      c) [40,60]
      d) (40,60)

33   If the following code is executed, what will be the output of the following code?
name="ComputerSciencewithPython"
print(name[3:10])

34   Which of the following statement(s) would give an error during execution of the following code?

```
tup = (20,30,40,50,80,79)
print(tup)              #Statement 1
print(tup[3]+50)        #Statement 2
print(max(tup))         #Statement 3
tup[4]=80               #Statement 4
```

      a) Statement 1
      b) Statement 2
      c) Statement 3
      d) Statement 4

35   Consider the statements given below and then choose the correct output from the given options:
pride="#G20 Presidency"
print(pride[-2:2:-2])
      a) ndsr
      b) ceieP0
      c) ceieP
      d) yndsr

36   Given is a Python list declaration :
    Listofnames=["Aman", "Ankit", "Ashish", "Rajan", "Rajat"]

Write the output of:
   print (Listofnames [-1:-4:-1])

37   What will be the output of the following code:
       Cities=['Delhi','Mumbai']
       Cities[0],Cities[1]=Cities[1],Cities[0]
       print(Cities)

38   What will be the output of the following code?
        tup1 = (1,2,[1,2],3)
       tup1[2][1]=3.14
       print(tup1)
           a) (1,2,[3.14,2],3)
           b)   (1,2,[1,3.14],3)
           c) (1,2,[1,2],3.14)
           d)   Error Message

39   Select the correct output of the code:

```
s = "Python is fun"
l = s.split()
s_new = "-".join([l[0].upper(), l[1], l[2].capitalize()])
print(s_new)
```

           a)   PYTHON-IS-Fun
           b) PYTHON-is-Fun
           c) Python-is-fun
           d) PYTHON-Is –Fun

40   What will be the result of following python code?

```
a,b=5,10
a,b=b+2,a-1
print("a=",a,"b=",b)
a+=2
b=b/2
print("a=",a,"b=",b)
```

41   For a string S declared as S="PYTHON", Which of the following is incorrect:
           a) N=len(s)
           b) T=S
           c) "T" in S
           d) S[0]="M"

42   Which of the following statement(s) would give an error after executing the
       following code?
       Stud={"Murugan":100,"Mithu":95}   # Statement 1
       print (Stud [95])   # Statement 2
       Stud ["Murugan"]=99   # Statement 3
       print (Stud.pop())   # Statement 4

print (Stud)   # Statement 5
- a) Statement 2
- b) Statement 4
- c) Statement 3
- d) Statements 2 and 4

43   What will be the output of following Python code?

```
>>> d={1:"Ajay",2:"Neeta",3:"Saira"}
...
>>> print("Neeta" in d)
```

- a) False
- b) True
- c) Error
- d) None

44   Write a statement in Python to declare a dictionary whose keys are 1, 2, 3 and values are Monday, Tuesday and Wednesday respectively.

45   Assertion(A): List is an immutable data type
Reasoning(R): When an attempt is made to update the value of an immutable variable, the old variable is destroyed and a new variable is created by the same name in memory
- a) Both A and R are true and R is the correct explanation for A
- b) Both A and R are true and R is not the correct explanation for A
- c) A is True but R is False
- d) A is false but R is True

46   Assertion (A): Python Standard Library consists of various modules.
Reasoning(R): A function in a module is used to simplify the code and avoids repetition.
- a) Both A and R are true and R is the correct explanation for A
- b) Both A and R are true and R is not the correct explanation for A
- c) A is True but R is False
- d) A is false but R is True

47   Assertion(A): List is an immutable data type
Reasoning(R): When an attempt is made to update the value of an immutable variable, the old variable is destroyed and a new variable is created by the same name in memory.
- a) Both A and R are true and R is the correct explanation for A
- b) Both A and R are true and R is not the correct explanation for A
- c) A is True but R is False
- d) A is false but R is True

48   Assertion (A) : List can not become key in a dictionary.
Reasoning(R) : Only integers can be keys in a dictionary.

a) Both A and R are true and R is correct explanation of A
b) Both A and R are true but R is not correct explanation of A
c) A is True but R is false
d) R is true but A is false

Weightage : 2 marks

1   Rewrite the following code in python after removing all syntax error(s). Underline each correction done in the code.

```
30=To
for K in range(0,To)
        IF k%4==0:
            print (K*4)
        Else:
            print (K+3)
```

2   Rewrite the following code after removing all syntax error(s) and underline each correction done:

```
Runs=(10,5,0,2,4,3)
for I in Runs:
    if I=0:
       print(Maiden Over)
    else:
       print(Not Maiden)
```

3   Evaluate the following Python expression:
      a) 2*3+4**2-5//2
      b) 6<12 and not (20>15) or (10>5)

4   Predict the output of the following code:

```
S="LOST"
L=[10,21,33,4]
D={}
for I in range(len(S)):
  if I%2==0:
     D[L.pop()]=S[I]
  else:
     D[L.pop()]=I+3
for K,V in D.items():
   print(K,V,sep="*")
```

5   Write the Python statement for each of the following tasks using BUILT-IN functions/methods only:
      (i) To insert an element 200 at the third position, in the list L1.
      (ii) To check whether a string named, message ends with a full stop / period or not.

6   A list named studentAge stores age of students of a class. Write the Python command to import the required module and (using built-in function) to display the most common age value from the given list.

Weightage : 3 marks

1   Find the output of the following code:

```
Name="PythoN3.1"
 R=""
for x in range(len(Name)):
        if Name[x].isupper():
            R=R+Name[x].lower()
        elif Name[x].islower():
            R=R+Name[x].upper()
        elif Name[x].isdigit():
            R=R+Name[x-1]
        else:
            R=R+"#"
 print(R)
```

2   Predict the output of the Python code given below:

```
Text1="IND-23"
Text2=""
I=0
while I<len(Text1):
    if Text1[I]>="0" and Text1[I]<="9":
        Val = int(Text1[I])
        Val = Val + 1
        Text2=Text2 + str(Val)
    elif Text1[I]>="A" and Text1[I]<="Z":
        Text2=Text2 + (Text1[I+1])
    else:
        Text2=Text2 + "*"
    I+=1
print(Text2)
```

Programming Practice

1   Write a function, lenWords(STRING), that takes a string as an argument and returns a tuple containing length of each word of a string. For example, if the string is "Come let us have some fun", the tuple will have (4, 3, 2, 4, 4, 3)

2   Write a function countNow(PLACES) in Python, that takes the dictionary, PLACES as an argument and displays the names (in uppercase)of the places whose names are longer than 5 characters. For example, Consider the following dictionary

PLACES={1:"Delhi",2:"London",3:"Paris",4:"New York",5:"Doha"}

The output should be:
LONDON NEW YORK

3   Write a function LShift(Arr,n) in Python, which accepts a list Arr of numbers and n is a numeric value by which all elements of the list are shifted to left. Sample Input

Data of the list
Arr= [10,20,30,40,12,11],
n=2
Output:
Arr = [30,40,12,11,10,20]

Functions
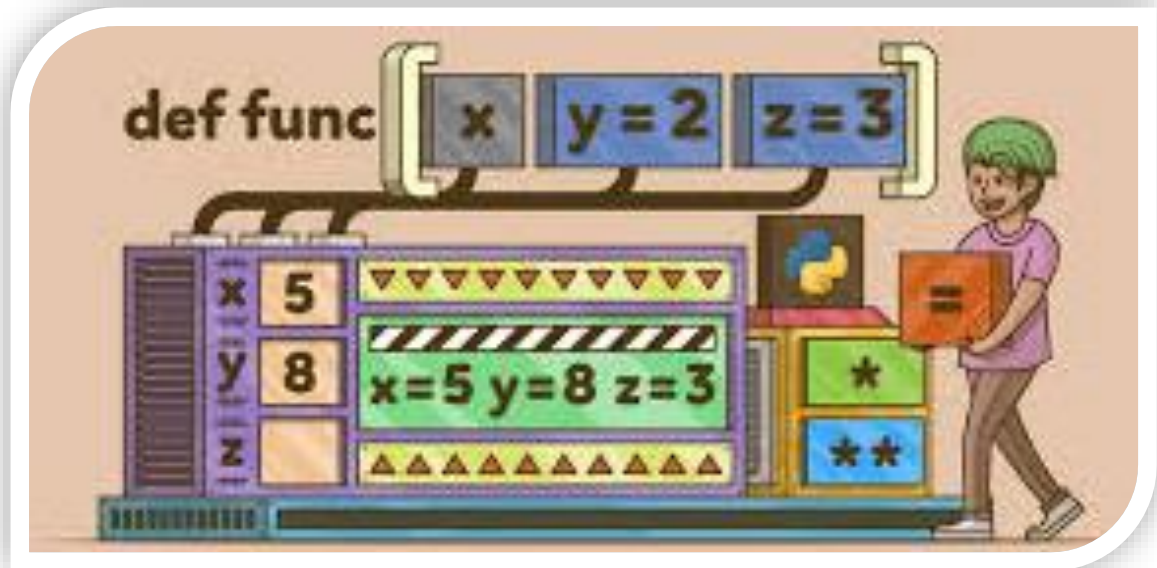
Topics to be covered

1. Introduction
2. Types of Functions
3. Create User Defined Function
4. Arguments And Parameters
5. Default Parameters
6. Positional Parameters
7. Function Returning Values
8. Flow of Execution
9. Scope of Variable

Function

Reusable block of code that performs a specific task. For example: len(), print(), min(), max(), sorted () , type() etc.

Types of Functions
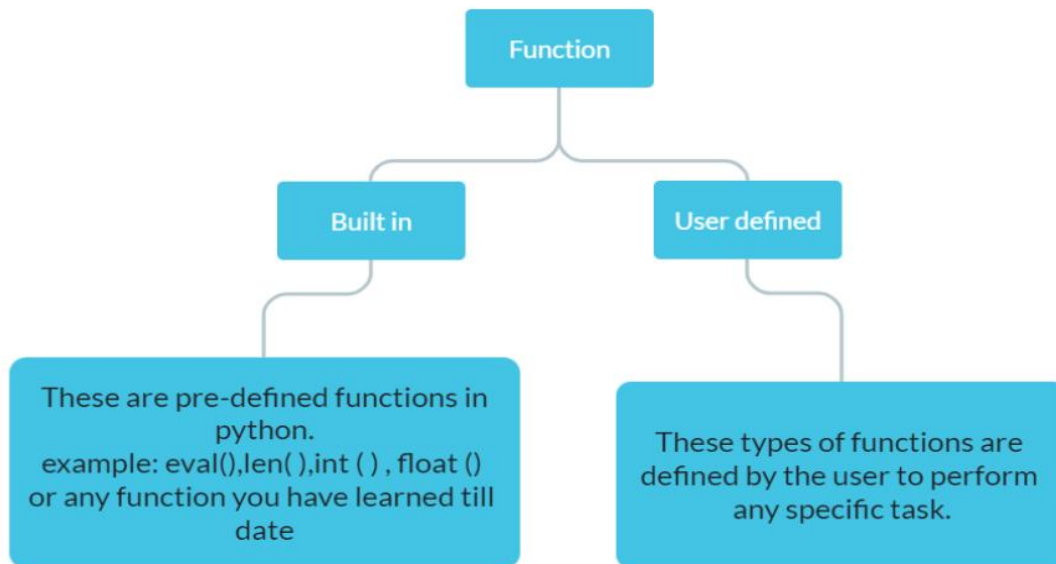
Defining a function in Python:

Name the function and specifies what to do when the function is called. Python interpreter ignores the function definition until the function is called.

Calling a function:

Calling the function actually performs the specified actions with the indicated parameters

Function Definition in Python

In Python a function is defined using the def keyword

```python
def my_function():
  print("Hello from a function")


my_function()
```

- Arguments: Information can be passed into functions as arguments. Arguments are specified after the function name, inside the parentheses. You can add as many arguments as you want, just separate them with a comma.

- Actual Parameters (Arguments) are values supplied to the function when it is invoked/called

- Formal Parameters are variables declared by the function that get values when the function is called.

Example 1:

Observe the following code:

```
def function1(x):# Function Definition
    print(x)
function1("first call to function") # calling function
function1("second call to function")#calling function
```

Output:

```
first call to function
second call to function
```

In the above example, a user defined function "function1" has been defined that receives one argument. Once the function is defined, it can be called any number of times with different arguments.

Formal argument: x

Actual argument:

"first call to function " passed in first call

"second call to function" passed in second call

Example 2: Write a function ADD(A,B) that receives two integer arguments and prints their sum.

```
def ADD(A,B): # function definition
    print(A+B)
ADD(7,9) # function call
ADD(10,15)#function call
ADD(20,25)#function call
```

Output:

```
----
16
25
45
```

return keyword:

In Python, the `return` keyword is used in functions to specify the value that the function will return when it is called. When a function is executed, it may perform some computations or operations, and the result can be sent back to the caller using the `return` statement.

The basic syntax for using the `return` statement is as follows:

```python
def my_function(arguments):
    # Code inside the function
    # ...
    return value_to_be_returned
```

Here's what you need to know about the `return` statement:

1. **Returning a Value:**

    When you want to return a specific value from the function, you can use the `return` statement followed by the value you want to return.

    Note: The function will stop executing immediately after the `return` statement is encountered, and the value will be passed back to the caller.

    ```python
    def add(a, b):
        return a + b

    result = add(5, 3)  # The function returns 8, and the value is assigned to the "result" variable.
    ```

2. **Returning Multiple Values:**

    Python allows you to return multiple values from a function as a tuple. You can simply separate the values with commas after the `return` statement.

    ```python
    def get_coordinates():
        x = 10
        y = 20
        return x, y

    x_coord, y_coord = get_coordinates()
    '''
    The function returns (10, 20), and the values are
    unpacked into the "x_coord" and "y_coord" variables.
    '''
    ```

3. **Returning None:**

    If a function doesn't have a `return` statement or has a `return` statement without any value, it implicitly returns `None`.
    `None` is a special constant in Python that represents the absence of a value.

    ```python
    def do_something():
        print("Doing something...")

    result = do_something()
    print(result)  # This will print "None".
    ```

4. **Early Exit with Return:**
   You can use the `return` statement to exit a function early if certain conditions are met. This is useful when you want to terminate the function before reaching the end.

```python
def divide(a, b):
    if b == 0:
        return "Cannot divide by zero!"
    return a / b

result1 = divide(10, 2)   # Returns 5.0
result2 = divide(10, 0)   # Returns "Cannot divide by zero!"
```

The `return` statement is a powerful tool that enables functions to produce results and pass data back to the calling code. Understanding how to use it correctly will help you design and implement effective functions in Python.

Scope of a variable:

In Python, the scope of a variable refers to the region of the program where the variable is accessible. The scope determines where a variable is created, modified, and used.

Global Scope:

- Variables defined outside of any function or block have a global scope.
- They are accessible from anywhere in the code, including inside functions.
- To create a global variable, you define it at the top level of your Python script or module.

```python
x = 10    # Global variable

def func():
    print(x)   # Accessing the global variable inside the function

def func1():
    print(x)   #Accessing the global variable inside the function

func()     # Output: 10
func1()    # Output:10
```

Local Scope:

- Variables defined inside a function have a local scope.
- They are accessible only within the function where they are defined.
- Local variables are created when the function is called and destroyed when the function returns.

```
def func():
    y = 5    # Local variable
    print(y)

func()    # Output: 5

# y is not accessible outside the function
# print(y) will result in an error
```

Points to be noted:

- When local variable and global variable have different names: global variable can be accessed inside the function

```
a=10 #global variable
def fun():
    x=20 #local variable
    y=x+a # global copy of variable a is accessed
    return y
print(fun()) # 30
```

- When local and global variable have same name : priority is given to local copy of variable

```
a=10 #global variable
def fun():
    a=20 #local variable
    y=20+a # local copy of variable a is accessed
    return y
print(fun()) # 40
```

Lifetime of a variable:

The lifetime of a variable in Python depends on its scope. Global variables persist throughout the program's execution, local variables within functions exist only during the function's execution.
Study the following programs:

Example 1:

```
g=100 # global variable

def f1():
    '''any changes made to local copy ofvariable g will
     not be refelcetd on global copy of variable g'''

    g=200# local copy of g will ve created, acccessible only in f1()
    g=g+10 # local g will be updated
    print(g)
print(g) # global g is accessible
f1()
print(g) # global variable is accessible
```

Example 2:

```python
var=40 # global var created that is visible througout the program

def fun1():
    var=20 #local copy of var is created
    var+=1 # local copy of var is increased by 1
    print(var)
def fun2():
    print(var)#global copy of var will be increased


print(var)# 40
fun1() # 21
print(var) # 40
fun2() # 40
print(var) #40
```

Passing list as argument to the function:

Please note that when a list if passed as arguments , the original copy of list is passed to the function i.e if any change is made at any index in the list inside the function , it is reflected in original list . That is because list is a mutable datatype and in Python, when you pass a list as an argument to a function, you are actually passing a reference to the list rather than a copy of the list. This means that the function parameter will point to the same memory location as the original list. As a result, any changes made to the list within the function will be reflected in the original list outside the function.

```python
def modify_list(some_list):
    some_list.append(4)
    some_list[0] = "modified"

my_list = [1, 2, 3]
modify_list(my_list)

print(my_list)  # Output: ['modified', 2, 3, 4]
```

However, if you assign a different list to a variable inside a function in Python, it will create a new local variable that is separate from any variables outside the function. This local variable will only exist within the scope of the function, and changes made to it won't affect the original list outside the function.

```python
def modify_list(some_list):
    some_list = [10, 20, 30]  # Assign a new list to the local variable
    print("Inside the function:", some_list)

my_list = [1, 2, 3]
modify_list(my_list)

print("Outside the function:", my_list)
```

Output:

```
======================
['modified', 2, 3, 4]
```

global keyword

In Python, the global keyword is used to indicate that a variable declared inside a function should be treated as a global variable, rather than a local variable. When you assign a value to a variable inside a function, Python, by default, creates a local variable within that function's scope. However, if you need to modify a global variable from within a function, you must use the global keyword to specify that you want to work with the global variable instead.

Here's the basic syntax for using the global keyword:

```python
global variable_name
```

For example:

```python
global_var = 10

def modify_global():
    global global_var
    global_var = 20# global copy of variable will be modified

modify_global()
print(global_var)   # Output will be 20
```

Types of arguments passed to a function:

Positional Arguments:

- These are the most common type of arguments and are matched to the function parameters based on their positions. The first argument corresponds to the first parameter, the second argument corresponds to the second parameter, and so on.
- The number and order of positional arguments must match the function's parameter list.

```python
def add(a, b):
    return a + b

result = add(2, 3)   # Here, 2 and 3 are positional arguments.
```

Default Arguments:

- Default arguments are used when a function is called with fewer arguments than there are parameters.
- The default values are specified in the function definition.
- If a value is not provided for a parameter during the function call, the default value is used.

```python
def power(base, exponent=2):
    return base ** exponent

result1 = power(3)       # Using the default exponent (2)
result2 = power(3, 4)    # Providing a specific exponent (4)
```

Keyword Arguments:

- In this type, each argument is preceded by a keyword (parameter name) followed by an equal sign.
- The order of keyword arguments does not matter, as they are matched to the function parameters based on their names.
- These arguments provide flexibility to call a function with arguments passed in any order.

```python
def add(a, b, c=0):
    return a + b + c

result1 = add(1, 2)
result2 = add(a=1, b=2, c=3)
result3=add(b=10,a=2) # default value of c will be used

print(result1)  # Output: 3
print(result2)  # Output: 6
print(result3)  #output :12
```

Python modules:

- In Python, a module is a file containing Python code that defines variables, functions, and classes.
- Modules allow you to organize and reuse code by breaking it into separate files, making it easier to maintain and understand complex programs.
- Python's standard library comes with a vast collection of built-in modules that cover various functionalities
- If needed, you can also create your own custom modules.
- To use a module in your Python code, you need to import it using the import statement.
  math module:

- The math module in Python is a built-in module that provides various mathematical functions and constants.
- It is part of the Python Standard Library i.e. it does not require any additional installation to use.
- To use the math module, you need to import it at the beginning of your Python script.

```python
import math
```

- Once you've imported the module, you can access its functions and constants using the math prefix.
  Here are some commonly used functions and constants provided by the math module:

Mathematical Constants:

- math.pi: Represents the mathematical constant π (pi).
- math.e: Represents the mathematical constant e (Euler's number).
  Basic Mathematical Functions:
- math.sqrt(x): Returns the square root of x.
- math.pow(x, y): Returns x raised to the power y.
- math.exp(x): Returns the exponential of x (e^x).
- math.log(x, base): Returns the logarithm of x to the specified base (default base is e).
  Trigonometric Functions (all angles are in radians):
- math.sin(x), math.cos(x), math.tan(x): Sine, cosine, and tangent of x, respectively.
- math.asin(x), math.acos(x), math.atan(x): Arcsine, arccosine, and arctangent of x, respectively.
  Hyperbolic Functions:
- math.sinh(x), math.cosh(x), math.tanh(x): Hyperbolic sine, cosine, and tangent of x, respectively.
  Angular Conversion:
- math.degrees(x): Converts x from radians to degrees.
- math.radians(x): Converts x from degrees to radians.
  Miscellaneous:
- math.ceil(x): Returns the smallest integer greater than or equal to x.
- math.floor(x): Returns the largest integer less than or equal to x.
- math.factorial(x): Returns the factorial of x.
  Study the following examples:

Example 1:

```python
import math

print(math.sqrt(25))        # Output: 5.0
print(math.sin(math.pi/2))  # Output: 1.0
print(math.degrees(math.atan(1)))  # Output: 45.0 (angle in degrees)
```

Example 2:

```python
x = 3.7
rounded_up = math.ceil(x)
rounded_down = math.floor(x)

print("Rounded up:", rounded_up)   # Output: 4
print("Rounded down:", rounded_down)   # Output: 3
```

Example 3:

```python
import math

print("Value of π (pi):", math.pi)   # Output: 3.141592653589793
print("Value of e (Euler's number):", math.e)   # Output: 2.718281828459045
```

Statistics module:

- The statistics module in Python is another built-in module that provides functions for working with statistical data.
- It offers a variety of statistical functions to compute measures like mean, median, standard deviation, variance, etc.
- The statistics module is part of the Python Standard Library, so there's no need to install any additional packages to use it.
    Here are some commonly used functions provided by the statistics module:
- statistics.mean(data): Calculates the arithmetic mean (average) of the data.
- statistics.median(data): Computes the median value of the data.
- statistics.mode(data): Finds the mode (most common value) in the data.

Example 1:

```python
import statistics

data = [2, 4, 6, 8, 10]

median_high = statistics.median_high(data)
median_low = statistics.median_low(data)

print("Median High:", median_high)   # Output: 6
print("Median Low:", median_low)      # Output: 6
```

Example 2:

```python
import statistics
data = [2, 3, 3, 4, 4, 4, 5, 5, 5, 5]

mean_value = statistics.mean(data)
mode_value = statistics.mode(data)

print("Mean:", mean_value)  # Output: 4.0
print("Mode:", mode_value)  # Output: 5 (Note: 5 is the most common value, it appears 4 times)
```

random module

- The random module in Python is another built-in module that provides functions for generating random numbers, sequences, and making random choices.

- It is commonly used for tasks such as random number generation, random shuffling, and random sampling.

```python
import random
```

Here are some commonly used functions provided by the random module:

- random.random(): Generates a random float number in the range [0.0, 1.0).
- random.uniform(a, b): Generates a random float number in the range [a, b].
- random.randint(a, b): Generates a random integer in the range [a, b] (inclusive).
- random.choice(sequence): Picks a random element from a sequence (list, tuple, string, etc.).
- random.shuffle(sequence): Shuffles the elements of a sequence randomly (in-place).

Example 1:

What is the possible outcome/s of following code?

```python
import random

colors = ['red', 'green', 'blue', 'yellow', 'purple', 'orange']
random_sample = random.randint(3,5)
print(colors[random_sample])
```

Possible options:

a) green
b) yellow

c) blue

d) orange

Solution:

Here, the possible values for variable random-sample are 3, 4 and 5. Hence, the possible Outputs of above code are b) Yellow and d) orange.

Example 2:

What are the possible output/s for the following code?

```python
import random
low=25
point =5
for i in range (1,5):
    Number=low + random.randint(0,point)
    print(Number,end=" : ")
    point-=1;
print()
```

Output Options:

i. 29: 26:25 :28 :   ii. 24: 28:25:26:

iii. 29: 26:24 :28 :   iv. 29: 26:25:26:

Solution:

Option iv

Example 3:

What are the possible outcome/s for the following code:

```python
import random
LIMIT = 4
Points = 100 +random.randint(0,LIMIT);
for p in range(Points,99,-1):
    print(p,end="#")
print()
```

Output Options:
   i. 103#102#101#100#   ii. 100#101#102#103#
   iii. 100#101#102#103#104#   iv. 4#103#102#101#100#

Solution:

Option i and option iv

1. What will be the output of the following code?

```
a=10
def call():
    global a
    b=20
    a=a+b
    print(a)
call( )
```

   a) 10
   b) 30
   c) error
   d) 20

2. Name the Python Library modules which need to be imported to invoke the following functions:
   a) sin()
   b) randint()

3. What is the scope of a variable defined inside a function?
   a) Global scope
   b) Local scope
   c) Universal scope
   d) Function scope

4. In Python, can a function return multiple values simultaneously?
   a) Yes
   b) No

5. What is the purpose of the "return" statement in a function?
   a) It specifies the type of the function.
   b) It defines the input parameters of the function.
   c) It indicates the end of a function.
   d) It returns a value from the function to the caller.

6. Which of the following module functions generates an integer?
   a) randint()
   b) uniform()
   c) random()
   d) all of these

7. The return type of the input() function is
   a) string
   b) integer
   c) list
   d) tuple

8. The values being passed through a function call statements are called
   a) Actual parameter
   b) Formal parameter
   c) default parameter
   d) None of these

9. Which of the following components are part of a function header in Python?
   a) Function Name
   b) Return Statement
   c) Parameter List
   d) Both a and c

10. Which of the following function header is correct?
    a) def cal_si(p=100, r, t=2)
    b) def cal_si(p=100, r=8, t)
    c) def cal_si(p, r=8, t)
    d) def cal_si(p, r=8, t=2)

11. Which of the following is the correct way to call a function?
    a) my_func()
    b) def my_func()
    c) return my_func
    d) call my_func()

12. Consider the code given below:
    Which of the following statements should be given in the blank for #Missing
    Statement, if the output produced is 110?

    ```
    b=100
    def test(a):
        _____      # missing statement
        b=b+a
        print(a,b)
    test(10)
    print(b)
    ```
    a) global a
    b) global b=100
    c) global b
    d) global a=100

13. What will be the output?

```
def increment(x):
    x += 1
    return x

value = 5
increment(value)
print(value)
```

a) 5
b) 6
c) 4
d) This code will raise an error.

14. A function is defined as below, the function call parameters can be:

```
>>> def first(a,b=9):
            print(a,"  ",b)
```

a) Two tuples
b) Two numbers
c) One number
d) All of the above

15. Statistics.mode([10,10,11,12,14,11,11,15,15,16,15]) will return
    (consider module is imported)
    a) 10
    b) 15
    c) 11
    d) Error

16. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables Lower and Upper.

```
import random
AR=[20,30,40,50,60,70];
Lower =random.randint(1,3)
Upper =random.randint(2,4)
for K in range(Lower, Upper +1):
    print (AR[K],end="#")
```

a) 10#40#70#
b) 30#40#50#
c) 50#60#70#
d) 40#50#70#

17. What will be the output of the Python code?
    ```
    >>> def testify(a,b):
                return a-b
    >>> sum=testify(22,55)
    >>> sum+30
    ```
    a) 33
    b) -33
    c) 3

d) -3

18. What will be the output of the following code?
```
>>> def a(b=11, c=21):
          b += 13
           c -= 13
          return b+c 0.77
>>> print(a(25), a(35))
```
   a) 15 18
   b) 46 56
   c) 25 35
   d) 13 12

19. What will be the output of the following code?
```
    num=100
    def showval(X):
            global num
            num = 85
             if(X%2==0):
                 num += X
             else:
                 num -= X
            print(num,end="#")
    showval(33)
    print(num)
```
   a) 100#52
   b) 85#52
   c) 85#33
   d) 185#52

20. Find the impossible option from the following
```
        >>> import random
        >>> L=[i for i in range(random.randint(3,5))]
```
   a)   [0, 1, 2, 3]
   b)   [0, 1, 2, 3, 4]
   c)   [0, 1, 2, 3, 4, 5]
   d)   [0, 1, 2]

21. Look at the function definition and the function call and determine the correct
    output
```
>>> def test(a):
          if(a>10):
                a += 10
          if(a>20):
                a += 20
          if(a>30):
```

```
        a +=30
    print(a)
>>> test(11)
```

a) 21
b) 72
c) 61
d) 71

22. Predict output:

```
def modify_list(lst):
    lst.append(6)
    lst[0] = 100

numbers = [1, 2, 3, 4, 5]
modify_list(numbers)
print(numbers)
```

a) [1, 2, 3, 4, 5, 6]
b) [100, 2, 3, 4, 5, 6]
c) [100, 2, 3, 4, 5]
d) [1, 2, 3, 4, 5]

23. Predict output:

```
def modify_list(lst):
    lst = [1, 2, 3, 4]

numbers = [5, 6, 7]
modify_list(numbers)
print(numbers)
```

a) [1, 2, 3, 4]
b) [5, 6, 7]
c) [1, 2, 3, 4, 5, 6, 7]
d) This code will raise an error.

24. Assertion (A): To use a function from a particular module, we need to import the module.
    Reason   (R): import statement can be written anywhere in the program, before using a function from that module.
    a) Both A and R are true and R is the correct explanation for A
    b) Both A and R are true and R is not the correct explanation for A
    c) A is True but R is False
    d) A is false but R is True

25. What will be the output of the following Python code?
    ```
    def add (num1, num2):
            sum = num1 + num2
     sum = add(20,30)
    print(sum)
    ```

26. Find and write the output of following python code:
    ```
    def Alter(M,N=45):
       M = M+N
       N = M-N
       print(M,"@",)
       return M
    A=Alter(20,30)
    print(A,"#")
    B=Alter(30)
    print(B,"#")
    ```

27. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables FROM and TO.
    ```
    import random
    AR=[20,30,40,50,60,70];
    FROM=random.randint(1,3)
    TO=random.randint(2,4)
    for K in range(FROM,TO+1):
            print (AR[K],end="#")
    ```
    a) 10#40#70#
    b) 30#40#50#
    c) 50#60#70#
    d) 40#50#70#

28. **Predict output:**

    ```
    global_var = 10
    def func1():
        print("Inside func1:", global_var)
    def func2():
        global global_var
        global_var = 20
    func1()
    print("Outside any function:", global_var)
    func2()
    print("After func2:", global_var)
    ```

29. **Predict output:**

```
def Changer(P,Q=10):
    P=P/Q
    Q=P%Q
    return P

A=200
B=20
A=Changer(A,B)
print(A,B, sep='$')
```

30. Rewrite the following code after removing the syntactical errors (if any). Underline each correction.

```
def chksum:
    x= input("Enter a number")
    if (x%2 = 0):
        for i range(2*x):
            print i
        loop else:
            print "#"
```

31. What will be the output of the following code?

```
def my_func(var1=100, var2=200):
        var1+=10
        var2 = var2 - 10
        return var1+var2
print(my_func(50),my_func())
```

32. What will be the output of the following code?

```
value = 50
def display(N):
    global value
    value = 25
    if N%7==0:
        value = value + N
    else:
        value = value - N
print(value, end="#")
display(20)
print(value)
```

33. What will be the possible outcomes:

```
import random
List=["Delhi","Mumbai","Chennai","Kolkata"]
for y in range(4):
    x = random.randint(1,3)
    print(List[x],end="#")
```
   a)   Delhi#Mumbai#Chennai#Kolkata#
   b)   Mumbai#Chennai#Kolkata#Mumbai#
   c)   Mumbai# Mumbai #Mumbai # Delhi#
   d)   Mumbai# Mumbai #Chennai # Mumbai

34. What will be the output of the following code?

```
def short_sub (lst,n) :
    for i in range (0,n) :
        if len (lst)>4:
            lst [i]=lst [i]+lst[i]
        else:
            lst[i]=lst[i]
subject=['CS','HINDI','PHYSICS','CHEMISTRY','MATHS']
short_sub(subject,5)
print(subject)
```

35. What is the output of the following code snippet?

i.	ii.
```a =30```	```def ChangeVal (M,N):```
```def call (x) :```	``` for i in range (N):```
``` global a```	``` if M[i]%5 == 0:```
``` if a%2==0:```	``` M[i]//=5```
``` x+=a```	``` if M[i]%3 == 0:```
``` else:```	``` M[i]//=3```
``` x-=a```	```L = [25,8,75,12]```
``` return x```	```ChangeVal (L,4)```
```x=20```	```for i in L:```
```print(call(35),end="#")```	``` print(i,end="#")```
```print(call(40),end= "@")```	

36. What will be the output of the following code?

```
x = 3
def myfunc():
    global x
    x+=2
    print(x, end=' ')
print(x, end=' ')
myfunc()
print(x, end=' ')
```

37. Find and write the output of the following Python code:

```
def Display(str):
    m=""
    for i in range(0,len(str)):
        if(str[i].isupper()):
            m=m+str[i].lower()
        elif str[i].islower():
            m=m+str[i].upper()
        else:
            if i%2==0:
                m=m+str[i-1]
            else:
                m=m+"#" print(m)
```

Display('Fun@Python3.0')

38. Find and write the output of the following python code:

I	ii
| ```python
def fun(s):
        k=len(s)
        m=" "
        for i in range(0,k):
            if(s[i].isupper()):
                m=m+s[i].lower()
            elif s[i].isalpha():
                m=m+s[i].upper()
            else:
                m=m+'bb'
        print(m)
fun('school2@com')
``` | ```python
def Change(P ,Q=30):
        P=P+Q
        Q=P-Q
        print( P,"#",Q)
        return (P)
R=150
S=100
R=Change(R,S)
print(R,"#",S)
S=Change(S)
``` |

39. What are the possible outcome/(s) for the following code.Also specify the maximum and minimum value of R when K is assigned value as 2:

```python
import random

Signal = [ 'Stop', 'Wait', 'Go' ]
for K in range (2, 0, -1):
    R = randrange (K)
    print (Signal[R], end = ' # ')
```

a) Stop # Wait # Go
b) Wait # Stop #
c) Go # Wait #
d) Go # Stop #

40. Write the output of the following Python code:

```python
def change (A) :
    S=0
    for i in range (len (A)//2):
        S+= (A[i]*2)
    return S
B = [10,11,12,30,32,34,35,38,40,2]
C = Change (B)
Print ('Output is',C)
```

41. Explain the positional parameters in Python function with the help of suitable example.

42. Predict the output of following:

i.	ii.
```python\nimport math\nn = 9\nr = math.sqrt(n)\nres = math.pow(r, 3)\nprint(res)\n```	```python\nimport math\nradius=5\narea=(math.pi)*radius**2\nprint(area)\n```
iii.	iv.
```python\nimport math\nn = 4.3\nres = math.ceil(n) + math.floor(n)\nprint(res)\n```	```python\nimport statistics\nn = [12, 15, 24, 30, 35, 40]\nm = statistics.mean(n)\nprint(m)\n```
v	vi
```python\nimport statistics\nn = [12, 15, 24, 30, 35, 40, 30]\nm = statistics.median(n)\nprint(m)\n```	```python\nimport statistics\nn = [1, 3, 5, 1, 3, 1, 5, 7, 1]\nm = statistics.mode(n)\nprint(m)\n```

43. Predict output :

```python
def sub(a, b):
    return a - b

result = sub(3, 4)
print(result)
```

44. What possible outputs(s) will be obtained when the following code is executed?

```python
import random
myNumber=random.randint(0,3)
COLOR=["YELLOW","WHITE","BLACK","RED"]
for I in range(1,myNumber):
    print(COLOR[I],end="*")
    print()
```

Options:
a) RED*
   WHITE*
   BLACK*

b) WHITE*
   BLACK*

c) WHITE* WHITE*
   BLACK* BLACK*

d) YELLOW*
   WHITE*WHITE*
   BLACK* BLACK* BLACK*

45. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables BEGIN and END.

```
import random
RUNS =[40,55,60,35,70,50]
BEGIN =random.randint(0,2)
END =random.randint(1,3)
for i in range(BEGIN,END+1):
    print(RUNS[i],end='#')
```

a) 60#35#
b) 60#35#70#50#
c) 35#70#50#
d) 40#55#60#

46. What possible outputs(s) are expected to be displayed on screen at the time of execution of the program from the following code? Also specify the maximum values that can be assigned to each of the variables Lower and Upper.

```
import random
AR=[20,30,40,50,60,70]
Lower =random.randint(1,3)
Upper =random.randint(2,4)
for K in range(Lower, Upper +1):
    print (AR[K],end="#")
```

a) 10#40#70#
b) 30#40#50#
c) 50#60#70#
d) 40#50#70#

47. What are the possible outcome/s for the following code:

```
import random
MIN = 25
SCORE = 10
for i in range (1,5):
    Num = MIN + random.randint(0,SCORE)
    print(Num,end=":")
    SCORE-=1;
print()
```

Options:
a) 34:31:30:33:
b) 29:33:30:31:
c) 34:31:30:31:
d) 34:31:29:33:

48. What are the possible outcome/s :

1
```
Guess=65
for I in range(1,5):
    New=Guess+random.randint(0,I)
    print(chr(New),end=' ')
```

Output Options:
    a) A B B C
    b) A C B A
    c) B C D A
    d) C A B D

2
```
Score=[ 25,20,34,56, 72, 63]
Myscore = Score[2 + random.randint(0,2)]
print(Myscore)
```

Output Options :
    a) 25
    b) 34
    c) 20
    d) None of the above

3
```
Marks = [99, 92, 94, 96, 93, 95]
MyMarks = Marks [1 + random.randint(0,2) ]
print(MyMarks)
```

Output Options :
    a) 99
    b) 94
    c) 96
    d) None of the above

4
```
Disp=22
Rnd=random.randint(0,Disp)+15
N=1
for I in range(3,Rnd,4):
        print(N,end=" ")
        N+=1
print()
```
Output Options:
    a) 1
    b) 1 2 3 4
    c) 1 2
    d) 1 2 3

5   Area=["NORTH","SOUTH","EAST","WEST"]
        for I in range(3):
                ToGo=random.randint(0,1) + 1
                print(Area[ToGo],end=":")
        print()
        Output Options:
            a) SOUTH : EAST : SOUTH :
            b) NORTH : SOUTH : EAST :
            c) SOUTH : EAST : WEST :
            d) SOUTH : EAST : EAST :

6   MIN = 25
        SCORE = 10
        for i in range (1,5):
            Num = MIN + random.randint(0,SCORE)
             print(Num,end=":")
             SCORE-=1;
        print()
        Output Options:
            a) 34:31:30:33:
            b) 29:33:30:31:
            c) 34:31:30:31:
            d) 34:31:29:33:

49. Ms. Sana wants to increase the value of variable x by 1 through function modify(). However this code raises error .Help sana to rectify the code:

```
x=20
def modify():
    x+=1
print(x)
```

50. Predict output :

i.

```
def maximum(x, y):
    if x > y:
        return x
    elif x == y:
        return 'The numbers are equal'
    else:
        return y
print(maximum(2, 3))
```

ii.

```
def func1 (n = 1, n1 = 2):
        n = n + n1
        n1 += 1
        print (n, n1)
func1()
func1(2,1)
func1(3)
```

iii.	iv.
| ```python
def greet(name):
    print("Hello, " + name)

result = greet("Anuj")
print(result)
``` | ```python
def test(x):
    x += 1

num = 5
test(num)
print(num)
``` |

51. What will be the output of the following code fragments:

i.	ii.
| ```python
a=10
def func1():
    a=20
    print(a)
print(a)
func1()
print(a)
``` | ```python
x=30
def A1(x):
    x+=1
    print(x)
print(x)
A1(x)
print(x)
``` |
| iii. | iv. |
| ```python
num=20
def myfunc ():
        num = 10
        return num
print (num)
print (myfunc())
print (num)
``` | ```python
L1=[20,3,67,89,22]
def updatelist(L):
    L[0]=L[1]+L[3]
    L[3:4]=[100,200,300]

print(L1)
updatelist(L1)
print(L1)
``` |

52. What will be the output of the following Python Code?

```python
v = 50
def Change (N):
        global V
        V, N = N, V
        print (V, N, sep = '#', end = '@')
Change (20)
print (V)
```

53. Predict output:

```python
def divide(a, b):
    if b == 0:
        return "You can't divide any number by zero", None
    return a / b, "Division successful."

res, msg = divide(50, 5)
print(res, msg)

res, mes = divide(50, 0)
print(res, msg)
```

54. Predict output:

i.	ii.
| ```python
var=17
def fun1():
    var=3
    var=var+1
    print(var)
def fun2():
    global var
    var=var+2
    print(var)
print(var)
fun1( )
print(var)
fun2( )
print(var)
``` | ```python
def div5(n):
    if n%5==0:
        return n*5
    else:
        return n+5
def output(m=5):
    for i in range(0,m):
        print(div5(i),"@",end="")
    print("\n")
output(7)
output()
output(3)
``` |
| iii. | iv. |
| ```python
def change_global():
    global_var = "Hello"

global_var = "Hi"
change_global()
print(global_var)
``` | ```python
x = 100

def add_to_global(value):
    global x
    x += value

add_to_global(50)
print(global_var)
``` |

Practical Exercise

1. Write a Python function named `calculate_gross_salary` that takes the basic salary (an integer) as an argument and returns the gross salary. The gross salary is calculated as follows:
    - If the basic salary is less than or equal to 10000, the gross salary is the basic salary plus 20% of the basic salary.
    - If the basic salary is more than 10000, the gross salary is the basic salary plus 25% of the basic salary.
    Write the function definition for `calculate_gross_salary` and use it to calculate the gross salary for a basic salary of 12000.

2. Write a Python function called calculate_average that takes a list of numbers as input and returns the average of those numbers.

3. Write a function update_list(L) that receives a list as arguments and increases the value of even elements by 2.
    For example: if the list is [2,4,6,7,9]
    after execution of function, the list should be : [4,6,8,7,9]

Exception Handling

Topics to be covered

1. Introduction
2. Types of errors
3. Handling Exceptions Using Try – Except – Finally Blocks

EXCEPTION HANDLING

While executing a Python program, it may happen that the program does not execute at all or it can generate unexpected output. This happens when there are syntax errors, run time errors, logical errors or any semantic errors in the code.

SYNTAX ERROR	SEMANTIC ERROR	LOGICAL ERROR	RUN TIME ERROR
It occurs when we put some incorrect punctuation, incorrect word sequence or there are some undefined terms or missing parenthesis. Syntax errors are also called as **Parsing errors.** **For example:** >>> p=2(num1+num2) This statement is mathematically correct but python interpreter will raise SYNTAX error as there is no sign present between 2 and parenthesis. The correct statement will be: >>> p=2*(num1+num2)	It occurs when the code is correct according to syntax but it is not meaningful. The code will not behave as expected. **For example:** A = 10 B = "hello" Result = A + B Here, The code will execute as it has correct syntax but will not generate expected output.	It may occur when there may be some improper sequence of statements or incorrect use of operator. It will not stop a program from executing but will produce incorrect output. It will generate incorrect output for every value of input. **For example:** If we want to find sum of two numbers and write the following code: A, B = 10, 15 C = A * B print ("Sum is: ", C) Here, the code will generate A * B but we wanted to find Sum. Hence it is a logical error.	It occurs at the time of program execution. Such errors produce incorrect output for specific values of input. These errors are also called **Exceptions,** which occur when something unexpected happens leading to stop the program execution. **For example:** 5. Division by zero 6. Finding square root of negative number. 7. Insufficient memory available on computer. 8. Trying to open a file that does not exist.

EXCEPTIONS:

11. Run time errors are known as Exceptions.
12. When an Exception is generated, the program execution is stopped.
13. Removing errors from a code is referred to as EXCEPTION HANDLING.
14. Commonly occurring exceptions are usually defined in the Interpreter. These are known as Built-in Exceptions.

Some Built-in Exceptions are listed as below:

EXCEPTION	DESCRIPTION
ZeroDivisionError	It is raised when an expression or a value is getting divided by zero (0). For example: If c = 0, then p = b/c will result in 'ZeroDivisionError'.
NameError	It is raised when an identifier is not assigned any value earlier and is being used in some expression. For example: p = a*b/c then it will result in 'NameError' when one or more variables are not assigned values.
TypeError	It is raised when variables used in any expression have values of different data types. For example: p=(a+b)/c then it will result in 'TypeError' when the variables a, b and c are of different data types.
Value Error	It is raised when given value of a variable is of right data type but not appropriate according to the expression.
IOError	It is raised when the file specified in a program statement cannot be opened.
IndexError	It is raised when index of a sequence is out of the range.
KeyError	It is raised when a key doesn't exist or not found in a dictionary.

EXCEPTION HANDLING:

Every exception has to be handled by the programmer for successful execution of the program. To ensure this we write some additional code to give some proper message to the user if such a condition occurs. This process is known as **EXCEPTION HANDLING.**

Exception handlers separate the main logic of the program from the error detection and correction code. The segment of code where there is any possibility of error or exception, is placed inside one block. The code to be executed in case the exception has occurred, is placed inside another block. These statements for detection and reporting the execution do not affect the main logic of the program.

STEPS FOR EXCEPTION HANDLING:

An exception is said to be caught when a code designed for handling that particular exception is executed. In Python, exceptions, if any, are handled by using try-except-finally block. While writing a code, programmer might doubt a particular part of code to raise an exception. Such suspicious lines of code are considered inside a **try** block which will always be followed by an **except** block. The code to handle every possible exception, that may raise in try block, will be written inside the **except** block.

If no exception occurred during execution of program, the program produces desired output successfully. But if an exception is encountered, further execution of the code inside the try block will be stopped and the control flow will be transferred to the except block.

Example 1:

```python
n1 = int(input("Enter first number: "))
n2 = int(input("Enter second number: "))
try:
    result = n1 / n2
    print("Division result is: ", result)

except ZeroDivisionError:
    print("Denominator is Zero!! Division not possible.")
```
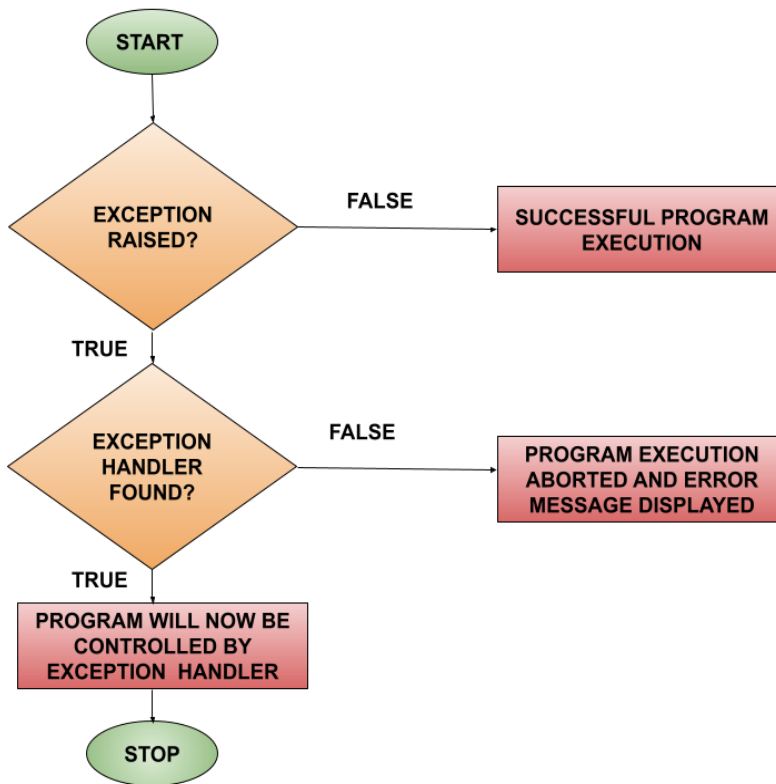
The output will be:

```
============ RESTART: C:/Users/my lapi/Desktop/exception example.py =====
Enter first number: 12
Enter second number: 2
Division result is:  6.0


============ RESTART: C:/Users/my lapi/Desktop/exception example.py =====
Enter first number: 12
Enter second number: 0
Denominator is Zero!! Division not possible.
```

Example 2:

```
a=int(input("enter a value")) # here user should enter an integer
enter a valueq
Traceback (most recent call last):
  File "<pyshell#1>", line 1, in <module>
    a=int(input("enter a value")) # here user should enter an integer
ValueError: invalid literal for int() with base 10: 'q'
```

In above example, the user entered a wrong value that raised ValueError. We can handle this exception by using ValueError exception.

```
try:
    a=int(input("enter a value")) # here user should enter an integer
    '''
the user may enter any value which cant be typecasted to integer.
in that case a value error exception will be raised. We can handle that exception
    '''
    print(a)
except ValueError:
    print("enter only integers")
```

Result:

```
enter a valueq
enter only integers
```

Use of multiple "except" block:

Sometimes, it may happen that a single piece of code in a program might have more than one type of error. If such an event happens, we can use multiple **except** blocks for a single **try** block.

Example 1:

```
    try:
        n1 = int(input("Enter first number: "))
        n2 = int(input("Enter second number: "))
        result = n1 / n2
        print("Division result is: ", result)

    except ZeroDivisionError:
        print("Denominator is Zero!! Division not possible.")

    except ValueError:
        print("Kindly enter only Integer Values.")
```

The output will be:

```
Enter first number: 25
Enter second number: a
Kindly enter only Integer Values.
```

Example 2:

```python
try:
    file = open("nonexistent_file.txt", "r")
    data = file.read()
    file.close()
    num = int(data)
    result = 10 / num
    print("Result:", result)
except FileNotFoundError:
    print("Error: File not found.")
except ZeroDivisionError:
    print("Error: Cannot divide by zero.")
except ValueError:
    print("Error: Invalid data. Please make sure the file contains a valid number.")
```

We can also handle exceptions without naming them.

```python
#handling exceptions without naming them.
try:
    n1 = int(input("Enter first number: "))
    n2 = int(input("Enter second number: "))
    result = n1 / n2
    print("Division result is: ", result)

except ValueError:
    print("Kindly enter only Integer Values.")

except:
    print("oops!! There are some Exceptions.")
```

The output will be:

```
Enter first number: 56
Enter second number: 0
oops!! There are some Exceptions.
```

Default exception messages can also be displayed when we are not handling exceptions by name.

```
try:
    n1 = int(input("Enter first number: "))
    n2 = int(input("Enter second number: "))
    result = n1 / n2
    print("Division operation performed")
except ValueError:
    print("Kindly enter only Integer Values.")
except Exception as e:
    print("There is an Exception, ", str(e))
else:
    print("Division result is: ", result)
finally:
    print("Have a good day!!")
```

The output will be:

```
Enter first number: 12
Enter second number: 0
There is an Exception,  division by zero
Have a good day!!
```

try...except...else Clause:

Just like Conditional and Iterative statements we can use an optional **else** clause along with the **try...except** clause. An except block will be executed only when some exceptions will be raised in the try block. But if there is no error then except blocks will not be executed. **In this case, else clause will be executed.**

```
try:
    n1 = int(input("Enter first number: "))
    n2 = int(input("Enter second number: "))
    result = n1 / n2
    print("Division operation performed")
except ValueError:
    print("Kindly enter only Integer Values.")
except:
    print("oops!! There are some Exceptions.")
else:
    print("Division result is: ", result)
```

The output will be:

```
Enter first number: 12
Enter second number: 2
Division operation performed
Division result is:  6.0
```

finally CLAUSE:

The **try…except…else** block in python has an optional **finally** clause. The statements inside the **finally** block are always executed whether an exception has occurred in the try block or not. If we want to use **finally** block, it should always be placed at the end of the clause i.e. after all except blocks and the else block.

```python
try:
    n1 = int(input("Enter first number: "))
    n2 = int(input("Enter second number: "))
    result = n1 / n2
    print("Division operation performed")
except ValueError:
    print("Kindly enter only Integer Values.")
except:
    print("oops!! There are some Exceptions.")
else:
    print("Division result is: ", result)
finally:
    print("Have a good day!!")
```

The output will be:

```
Enter first number: 12
Enter Second number: 2
Division operation performed.
Have a good day.
```

Exercise

1   In a try-except block, can there be multiple 'except' clauses?
    a) No, there can be only one 'except' clause.
    b) Yes, but only if the exceptions are of the same type.
    c) Yes, it allows handling different exceptions separately.
    d) No, 'except' clauses are not allowed in a try-except block.

2   When might you use the 'finally' block in exception handling?
    a) To handle exceptions that are expected to occur frequently.
    b) To provide a resolution for every possible error.
    c) To close resources that were opened in the 'try' block, regardless of whether an exception occurred or not.
    d) To avoid having to use 'except' blocks.

3   What will be the output of the following code snippet?

```python
try:
    result = 10 / 0
except ZeroDivisionError:
    print("Division by zero!")
except ArithmeticError:
    print("Arithmetic error occurred!")
else:
    print("No error!")
```

    a) Division by zero!
    b) Arithmetic error occurred!
    c) No error!
    d) This code will raise a syntax error.

4   Which of the following is NOT a standard built-in exception in Python?
    a) ValueError
    b) IndexError
    c) NullPointerException
    d) KeyError

5   What is an exception in programming?
    a) An error that occurs during runtime
    b) A warning message from the compiler
    c) A comment in the code
    d) A statement that terminates the program

6   What is the purpose of the "try" block in a try-except construct?
    a) To handle the exception by executing specific code
    b) To specify the type of exception to be thrown
    c) To define a custom exception class
    d) To ensure a specific block of code always executes

7   Which of the following exceptions in Python is not a built-in exception?
    a) ValueError

b) KeyError
c) CustomError
d) IndexError

8   Assertion (A): In Python, the "try" block is used to enclose code that might raise an exception.
     Reasoning (R): The "try" block is where the program attempts to execute code that might result in an exception. If an exception occurs, it is handled in the corresponding "except" block.
     A. Both A and R are true and R is correct explanation of A
     B. Both A and R are true but R is not correct explanation of A
     C. A is True but R is False
     D. R is True but A is False

9   Assertion (A): The "finally" block in Python is always executed, regardless of whether an exception is raised or not.
     Reasoning (R): The "finally" block contains code that is guaranteed to execute, whether an exception occurs within the "try" block or not.
     A. Both A and R are true and R is correct explanation of A
     B. Both A and R are true but R is not correct explanation of A
     C. A is True but R is False
     D. R is True but A is False

10   Assertion (A): Python allows multiple "except" blocks to be used within a single "try" block to handle different exceptions.
     Reasoning (R): By using multiple "except" blocks with different exception types, Python provides the flexibility to handle various types of exceptions separately.
     A. Both A and R are true and R is correct explanation of A
     B. Both A and R are true but R is not correct explanation of A
     C. A is True but R is False
     D. R is True but A is False

11   Code snippet:

```python
try:
    num = int(input("Enter a number: "))
    result = 10 / num
    print("Result:", result)
except ZeroDivisionError:
    print("Error: Cannot divide by zero.")
except ValueError:
    print("Error: Invalid input. Please enter a valid number.")
```

Predict the output when:
a) The user enters "0" .
b) The user enters "5".
c) The user enters "abc".

12   State whether the following statement is True or False: An exception may be raised even if the program is syntactically correct.

13   What will be the output of the following code if the input is "e":

```
try:
    value = int("abc")
    result = 10 / 0
except ValueError:
    print("Error: Invalid value conversion")
except ZeroDivisionError:
    print("Error: Division by zero")
```

14   What will be the output of the following code if the input is:
     i. 2   ii. 2.2

```
try:
    num = int(input("Enter a number: "))
except ValueError:
    print("Error: Invalid input")
else:
    print("Entered number: ",num)
```

15   Rewrite the following code after handling all possible exceptions.
```
num = int(input("Enter a number: "))
result = 10 / num
print("Result:", result)
```

16   Consider the code given below:
```
L = ['s', 45,23]
Result = 0
for x in L:
    print ("The element is ", x)
    Result += x
print("The addition of all elements of L is: ", Result)
```
Which of the following error will be raised by the given Python code?
a) NameError
b) ValueError
c) TypeError
d) IOError

17   Code snippet:
```
try:
    num1 = int(input("Enter the first number: "))
    num2 = int(input("Enter the second number: "))
    result = num1 / num2
except ZeroDivisionError:
    print("Error: Cannot divide by zero.")
except ValueError:
    print("Error: Invalid input. Please enter a valid number.")
else:
    print("Result:", result)
finally:
    print("Finally block executed.")
```
Predict the output when:
a) The user enters "10" for both numbers.

b) The user enters "5" for the first number and "0" for the second number.
c) The user enters "abc" for both numbers.

18   Which of the following statements is true?
a). The standard exceptions are automatically imported in Python programs.
b). All raised standard exceptions must be handled in Python.
c). When there is deviation from the rules of a programming language, a semantic error is thrown.
d). If any exception is thrown in try block, else block is executed.

19   Identify the statement(s) from the following options which will raise TypeError exception(s):
a) print('5')
b) print(5 * 3)
c) print('5' +3)
d) print('5' + '3')

Programming based question:

1   Create a simple calculator program that takes two numbers and an operator (+, -, *, /) as input. Implement exception handling to handle cases like division by zero and invalid operators.

2   Build a program that asks the user for an integer input. Use exception handling to ensure that the input is a valid integer. If the user provides invalid input, prompt them to retry until a valid integer is entered.

3   Create a program that connects to a database and performs database operations (e.g., insert, update, delete). Use exception handling to deal with database-related exceptions, such as connection errors or SQL syntax error.

4   Create a program that reads data from a file specified by the user. Implement exception handling to catch and handle the "FileNotFoundError" exception if the file does not exist.

5   Define a dictionary with some key-value pairs. Ask the user for a key and attempt to access the corresponding value from the dictionary. Handle the "KeyError" exception and display a message if the key is not found.

File Handling

Topics to be covered

1. Introduction
2. Types of files
3. Access specifiers in the file
4. File object methods seek( ) and tell( )
5. Text files and its methods
6. Binary file and its methods
7. CSV files and its methods
8. Absolute and Relative path

FILE HANDLING

Files are used to store data permanently and can be retrieved later.

Type of Files

1. Text Files
2. Binary Files
3. CSV Files

Steps for File handling:

1. Open File
2. Read/Write
3. Close File

Open Files: open( ) function is used to open files in python.

There are two ways to open files in python:

1. **file_object = open("file name", " access specifier")**
   a. i.e. f=open("test.txt","r")   #here our test file exists in the same directory of python.
   b. i.e. f=open(r"C:\Users\anujd\AppData\Local\Programs\Python\Python311\test.txt","r")

      Use 'r' before path indicates the data within quotes will be read as raw string and no special meaning attached with any character.

      Or

      f=open("C:\\Users\\anujd\\AppData\\Local\\Programs\\Python\\Python311\\test.txt","r")

      The slash in the path has to be doubled.

   c. In this we need to close the file.
   d. In this mode if we are writing into a file then we have to close the file otherwise our data will not be written into the file till now the file is not closed. The data remains in the output buffer and when we close the file then data is shifted from the output buffer to the file.
   e. flush( ): It forces the data waiting in the buffer immediately written into the file without waiting for closing of file.

2. **with open("file name","access specifier") as file_object:**
   a. i.e.   with open("test.txt","r") as f:

b. i.e. with
open(r"C:\Users\anujd\AppData\Local\Programs\Python\Python311\test.txt
","r") as f:
Or

with
open("C:\\Users\\anujd\\AppData\\Local\\Programs\\Python\\Python311\\t
est.txt","r") as f:

c. In this there is no need to close the file. It will automatically close the file.

Close Files: close( ) function is used to close files in python.

a. file_object.close( )
b. i.e. f.close( )

Access Specifiers in Files:

Access Mode for Text Files	Access Mode for Binary Files	Access Mode for CSV Files	Description	File Pointer Position
r	Rb	r	Read mode. Opens a file for reading.If the file does not exist, open() raises a FileNotFoundError.	Beginning of File
r+	rb+		It opens the file for both reading and writing. If the file does not exist, open() raises a FileNotFoundError.	Beginning of File
w	Wb	w	Write mode. It opens the file for writing only. If the file exists, the content of the file will be removed. If the file does not exist, it is created.	Beginning of File
w+	wb+		The w+ mode opens the file for both writing and reading. Like w, if the file exists, then the content of the file will be removed. If the file does not exist, it is created.	Beginning of File

a	Ab	a	The a mode opens the file for appending. In this the new content is added after the existing content. If the file does not exist, it creates the new file.	End of File
a+	ab+		The a+ mode opens the file for both appending and reading. In this the new content is added after the existing content. If the file does not exist, it is created.	End of File

Default mode for file opening in "r" read mode. If we didn't specify mode during the opening of the file then it will automatically open the file in read mode.

File Object Methods (seek( ) & tell( ))

Method	Prototype	Description
seek( )	**Syntax:** **<file_object>.seek(<offset>,<from_where>)** where: offset: number of positions to be more forward from_where: it defines to reference point Then it returns the new absolute position. i.e. **f.seek(10,0)** Here, f is the file handle, 10 is the offset (it moves the cursor 10 bytes forward), 0 means reference point at the beginning of file.	seek() function is used to change the position of the **File Handle** to a given specific position. File handle is like a cursor, which defines from where the data has to be read or written in the file. **0**: sets the reference point at the beginning of the file. **(default)** **1**: sets the reference point at the current file position. **2**: sets the reference point at the end of the file **Note:** In the case of a text file we can use only '**0**' as a reference point.
tell( )	**Syntax: <file_object>.tell( )**	tell() function returns the current position of the file object. This

	I.e. position=f.tell( ) Here, position will hold the integer value of the file pointer returned by tell function. f is the file handle.	method takes no parameters and returns an integer value. Initially the file pointer points to the beginning of the file(if not opened in append mode). So, the initial value of tell() is zero.

Text Files:

- It stores information in the form of ASCII or Unicode characters
- Each line of text is terminated with a special character called EOL (End of Line), which is the new line character ('\n') in python by default.
- File extension will be .txt

Working with Text Files:

1. Reading data from a file.
2. Writing data into a file.
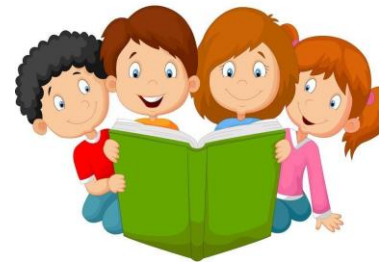
Reading data from files

There are three ways to read data from text file:

1. read function i.e. read( )
2. readline function i.e. readline( )
3. readlines function i.e. readlines( )

read( ) : It is used in text files to read a specified number of data bytes from the file. It returns the result in the form of a string.

Syntax: file_object.read( )

file_pointer.read(n): It will read the maximum n bytes/characters from the file.

f.read(7)   # it will read 7 bytes/characters from the position of file pointer.

file_pointer.read( ): It will read the entire content of the file.

f.read( )   # it will read all the data of the file from the position of file pointer.

readline( ): It will read one complete line in one go from the file. It returns the data in the form of a string.

Syntax: file_object.readline( )

file_pointer.readline( ): It will read the entire line.

f.readline( )   #it will read one complete line in one go.

file_pointer.readline(n): It will read the first 'n' bytes from the file.

f.readline(5)   #it will read the first 5 characters/bytes from the file.

readlines( ): It will return all the lines of the file as the elements of the list. I.e. the 1st line of the file will be the first element of the list and so on.

Syntax: file_object.readlines( )

file_pointer.readlines( ): It will read all the lines of the file as the elements of the list.

f.readlines( ) #it will read all the lines of the file as the elements of the list.

File Content

student.txt - C:\Users\anujd\AppData\Local\Programs\Python\Python311\student.txt (3.11.2)

File   Edit   Format   Run   Options   Window   Help

```
Education is a basic right.
Empowers individuals, enriches societies.
Varies across countries, cultures.
Challenges: access, funding, quality.
Essential for development, progress.
```

Code

```
f=open("student.txt","r")
data=f.read()
print(data)
```

Output

```
>>>
== RESTART: C:\Users\anujd\AppData\Local\P
Education is a basic right.
Empowers individuals, enriches societies.
Varies across countries, cultures.
Challenges: access, funding, quality.
Essential for development, progress.
```

```
f=open("student.txt","r")
data=f.read(7)
print(data)
```

```
>>>
= RESTART: C:/Users/anujd/
Educati
>>>
```

```python
f=open("student.txt","r")
data=f.readline()
print(data)
data=f.readline()
print(data)
```

```
>>>
= RESTART: C:/Users/anujd/AppData/Local/P:
Education is a basic right.

Empowers individuals, enriches societies.
```

```python
f=open("student.txt","r")
data=f.readline()
print(data,end="")
data=f.readline()
print(data,end="")
```

```
>>>
= RESTART: C:/Users/anujd/AppData/Local/P
Education is a basic right.
Empowers individuals, enriches societies.
>>>
```

```python
f=open("student.txt","r")
data=f.readline()
print(data,end="")
data=f.readline(5)
print(data,end="")
data=f.readline(7)
print(data,end="")
```

```
>>>
============ RESTART: C:/Use
Education is a basic right.
Empowers ind
```

```python
f=open("student.txt","r")
data=f.readlines()
print(data)
```

```
>>>
============ RESTART: C:/Users/anujd/AppData/Lo
cal/Programs/Python/Python311/filedemo1.py ====
=======
['Education is a basic right.\n', 'Empowers ind
ividuals, enriches societies.\n', 'Varies acros
s countries, cultures.\n', 'Challenges: access,
funding, quality.\n', 'Essential for developmen
t, progress.\n']
>>>
```

Result is in the form of a list.

```python
f=open("student.txt","r")
data=f.readlines()
for i in data:
    print(i,end="")
```

```
>>>
= RESTART: C:/Users/anujd/AppData/Local/P:
s/Python/Python311/filedemo1.py
Education is a basic right.
Empowers individuals, enriches societies.
Varies across countries, cultures.
Challenges: access, funding, quality.
Essential for development, progress.
>>>
```

Tips on writing text file code in exam:

- Let the file name be "abc.txt".
- Read the question carefully and find out what has to be read from the file.

Follow the below flow chart to write the code.
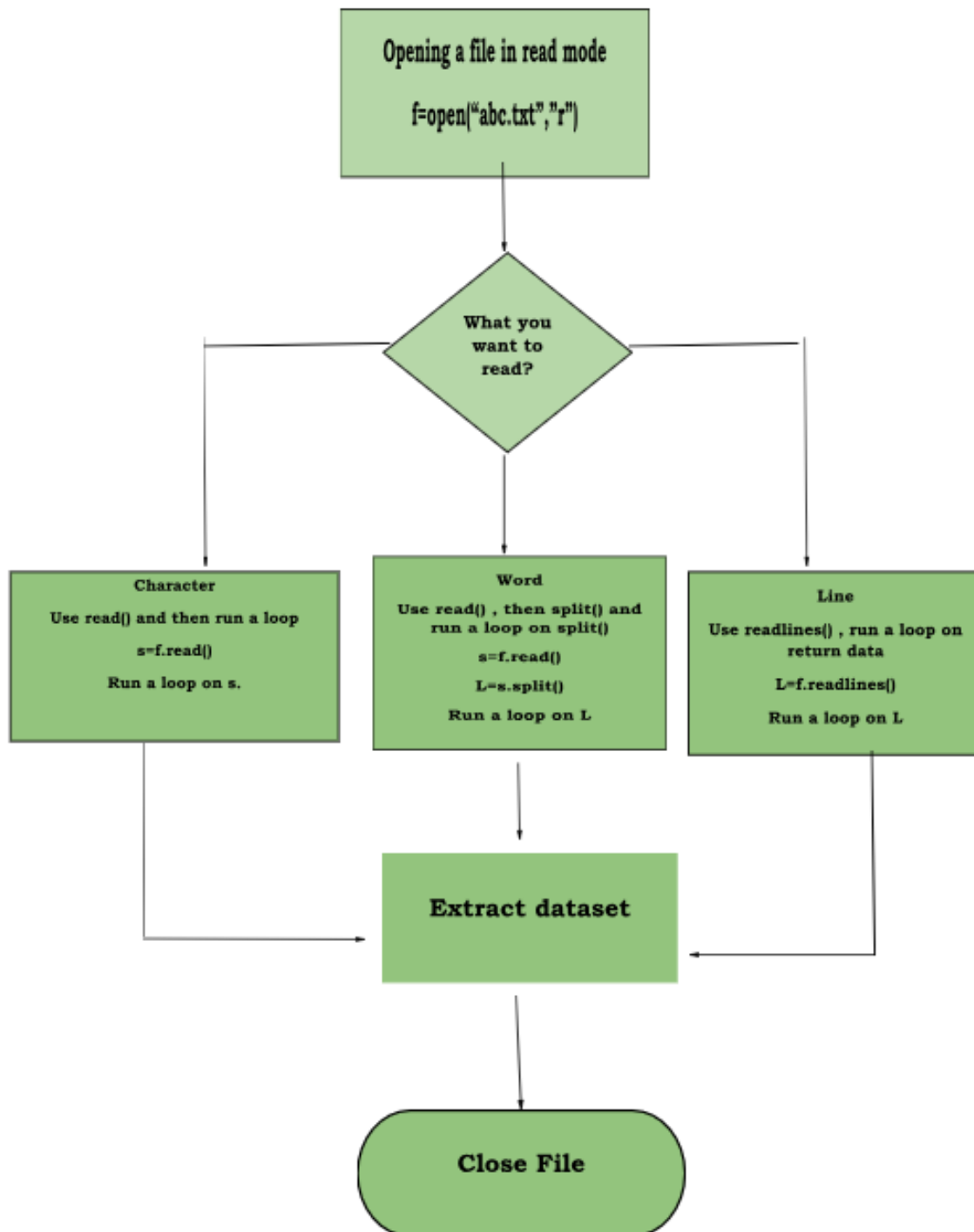
Example 1:

Write a function count_char() that reads a file named "char.txt" counts the number of times character "a" or "A" appears in it.

```python
def count_word():
    c=0 # variable to keep track of count
    f=open("char.txt","r") # step 1: open the file in read mode
    '''since the words are to be counted ,
     we will use read()'''
    s=f.read() # step 2, read entire data in s

    ''' run a loop on s to pick one character at a time'''
    for i in s:
        if i.upper()=="A" :
            c+=1 # increase the value of couter variable by 1
    f.close()
    return c
```

Example 2:

Write a function count_word() that reads a text file named "char.txt" and returns the number of times word " the" exists.

```python
def count_word():
    c=0 # variable to keep track of count
    f=open("char.txt","r") # step 1: open the file in read mode
    '''since the words are to be counted ,
     we will use read() to fetch data and use
     a split() on it '''
    s=f.read() # step 2, read entire data in s
    L=s.split() # a list L is created with list of words in entire file
    ''' run a loop on L to pick one word at a time'''
    for i in L:
        if i.upper()=="THE" :
            c+=1 # increase the value of couter variable by 1
    f.close()
    return c
```

Example 3:

Write a function count_line() that reads a text file named "char.txt" and returns the number of lines that start with a vowel.
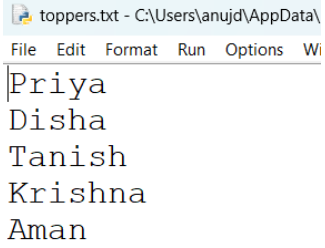
```
def count_word():
    c=0 # variable to keep track of count
    f=open("char.txt","r") # step 1: open the file in read mode
    '''since the words are to be counted ,
     we will use read()'''
    s=f.readlines() # step 2, read list of lines in s

    ''' run a loop on s to pick one line at a time'''
    for i in s:
        if i[0] in "aeiouAEIOU":
            c+=1
    f.close()
    return c
```

Writing data into Files

If the file doesn't exist then it will create the file.

1. **write( ):** It takes string as an input and writes it into the file.
   a. **Syntax**: file_object.write(string)
   b. i.e. f.write("Hello World")

2. **writelines( ):** It is used to write multiple lines as a list of strings into the file. In this each element of the list will be treated as a separate line in the file.
   a. **Syntax:** file_object.writelines(list of strings)
   b. I.e.   data=["I am a student of DOE", "I studies in class 12th"]
                f.writelines(data)

Code	Output
``f=open("toppers.txt","w")
f.write("Priya")
f.write("Disha")
f.write("Tanish")
f.write("Krishna")
f.write("Aman")
f.close()```	Content in "Topper.txt" file toppers.txt - C:\Users\anujd\AppData\Local\Programs\Python\Python311\t File Edit Format Run Options Window Help PriyaDishaTanishKrishnaAman But, we want these names in separate lines.
``f=open("toppers.txt","w")
f.write("Priya\n")
f.write("Disha\n")
f.write("Tanish\n")
f.write("Krishna\n")
f.write("Aman\n")
f.close()```	toppers.txt - C:\Users\anujd\AppData\ File Edit Format Run Options Wi Priya Disha Tanish Krishna Aman

```
with open("topper.txt","w") as f:
    for i in range(5):
        name=input("Enter the name of toppers one by one : ")
        f.write(name)
```

Output:

```
>>>
    ============ RESTART: C:/Users/anujd/AppData/Local
    Enter the name of toppers one by one : Priya
    Enter the name of toppers one by one : Disha
    Enter the name of toppers one by one : Tanisha
    Enter the name of toppers one by one : Krishna
    Enter the name of toppers one by one : Aman
>>>
```

Content of "Topper.txt" File:

toppers.txt - C:\Users\anujd\AppData\Local\Programs\Python\Python311\toppers.txt (3.11.2)

File   Edit   Format   Run   Options   Window   Help

```
PriyaDishaTanishaKrishnaAman
```

Question: Write a program in python with reference to above program, the content of the text files should be in different lines.

I.e.
Priya
Disha
Tanisha
Krishna
Aman
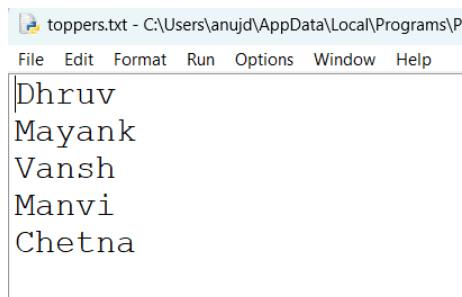
Code

```
with open("toppers.txt","w") as f:
    data=[]
    for i in range(5):
        name=input("Enter the name of toppers one by one : ")
        data.append(name+"\n")
    f.writelines(data)
```

Output

```
>>>
    = RESTART: C:/Users/anujd/AppData/Local/Programs/
    Enter the name of toppers one by one : Dhruv
    Enter the name of toppers one by one : Mayank
    Enter the name of toppers one by one : Vansh
    Enter the name of toppers one by one : Manvi
    Enter the name of toppers one by one : Chetna
>>>
```

Content of "**Toppers.txt**" file:
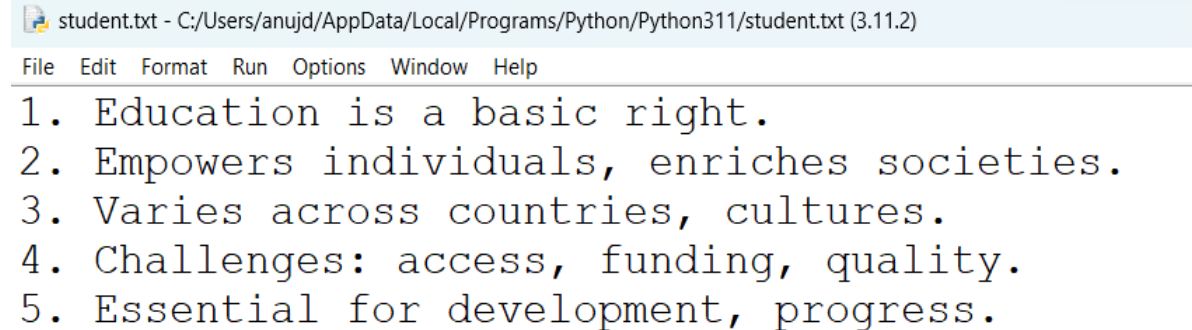
toppers.txt - C:\Users\anujd\AppData\Local\Programs\P

File   Edit   Format   Run   Options   Window   Help

```
Dhruv
Mayank
Vansh
Manvi
Chetna
```

Write a program in python to count vowels, consonants, digits, spaces, special characters, spaces, words and lines from a text file named "student.txt".

Content of File:

student.txt - C:/Users/anujd/AppData/Local/Programs/Python/Python311/student.txt (3.11.2)

File   Edit   Format   Run   Options   Window   Help

```
1. Education is a basic right.
2. Empowers individuals, enriches societies.
3. Varies across countries, cultures.
4. Challenges: access, funding, quality.
5. Essential for development, progress.
```

Code:

```python
vowel_count = 0
consonant_count = 0
digit_count = 0
special_count = 0
space_count=0
word_count = 0
line_count = 0
f=open("student.txt","r")
for line in f:
    line_count = line_count + 1
    words = line.split()
    word_count = word_count + len(words)
    for i in line:
        if i.lower() in "aeiou":
            vowel_count = vowel_count + 1

        elif i.lower() in "bcdfghjklmnpqrstvwxyz":
            consonant_count = consonant_count + 1

        elif i in "0123456789":
            digit_count = digit_count + 1

        elif i.isspace():
            space_count = space_count+ 1

        else:
            special_count = special_count + 1
print("Vowels:", vowel_count)
print("Consonants:", consonant_count)
print("Digits:", digit_count)
print("Special Characters:", special_count)
print("Spaces:", space_count)
print("Words:", word_count)
print("Lines:", line_count)
```

Output:

```
>>>
    = RESTART: C:/Users/anujd/AppData/I
    Vowels: 59
    Consonants: 89
    Digits: 5
    Special Characters: 16
    Spaces: 27
    Words: 26
    Lines: 6
>>>
```

Exercise

1. Define a function SGcounter() that counts and display number of S and G present in a text file 'A.txt'
   e.g., SAGAR JOON IS GOING TO MARKET.

   It will display S:2   G:2

2. Write a function in Python that counts the number of "is", "am" or "are" words present in a text file "HELLO.TXT". If the "HELLO.TXT" contents are as follows:
   Here are two sentences that contain "is," "am," or "are":

   "She is studying for her final exams.

   We are planning a trip to the mountains next weekend."

   The output of the function should be: Count of is/am/are in file: 2

3. Write a method in python to read lines from a text file HELLO.TXT to find and display the occurrence of the word "hello".

4. Write a user-defined function named Count() that will read the contents of a text file named "India.txt" and count the number of lines which start with either "I" or "T".
   E.g. In the following paragraph, there are 2 lines starting with "I" or "T":

   "The Indian economy is one of the largest and fastest-growing in the world, characterized by a diverse range of industries including agriculture, manufacturing, services, and information technology. It boasts a sizable consumer base and a dynamic entrepreneurial spirit. However, it also faces challenges such as income inequality, poverty, and infrastructure gaps, which the government continually addresses through policy reforms and initiatives to foster sustainable growth and development."

5. Write a method in python to read lines from a text file AZAD.TXT and display those lines, which are starting with an alphabet 'T'.

Binary Files:

1. Binary files are made up of non-human readable characters and symbols, which require specific programs to access its contents.
2. In this translation is not required because data is stored in bytes form.
3. Faster than text files.

4. pickle module is used for working with binary files
   a. import pickle
5. File extension will be .dat
6. There is no delimiter to end the file.

Working in Binary files:

Pickle module: pickle module is used in binary file for load( ) and dump( ) methods which are used for reading and writing into binary file respectively.

Pickling: It is the process of converting python object into byte stream. Pickling is done at the time of writing into a binary file.
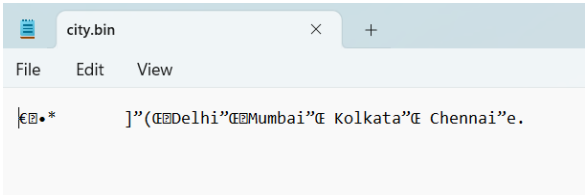
Unpickling: It is the process of converting a byte stream into python object. Unpickling is done at the time reading from a binary file.

dump( ): it is used to write data into binary file.

Syntax: identifier = pickle.dump(data , file_pointer)

Example: a= "My name is Anuj"

pickle.dump(a,f)   #here 'a' contains data and 'f' is a file pointer.


```
#Write a program to write city names in binary file

import pickle
f=open("city.bin","wb")
city=["Delhi","Mumbai","Kolkata","Chennai"]
pickle.dump(city,f)
f.close()
```

city.bin   ×   +

File   Edit   View

€•*   ]"(ŒDelhi"ŒMumbai"Œ Kolkata"Œ Chennai"e.

Program   Code

```
#Write a program in python
#To write student details into a binary file
import pickle
f=open("student.dat","wb")
record=[]
while True:
    rno=int(input("Enter the Roll No : "))
    name=input("Enter the Name : ")
    marks=int(input("Enter the Marks : "))
    x=[rno,name,marks]
    record.append(x)
    ch=input("Press 'y' for input more details : ")
    if ch not in "yY":
        break
pickle.dump(record,f)
f.close()
```

Input   Details

```
>>>
========================= RESTART: C:/Users
Enter the Roll No : 1
Enter the Name : Anuj
Enter the Marks : 75
Press 'y' for input more details : y
Enter the Roll No : 2
Enter the Name : Vishakha
Enter the Marks : 72
Press 'y' for input more details : y
Enter the Roll No : 10
Enter the Name : Zenil
Enter the Marks : 85
Press 'y' for input more details : y
Enter the Roll No : 15
Enter the Name : Zenith
Enter the Marks : 90
Press 'y' for input more details : n
>>>
```

File Content
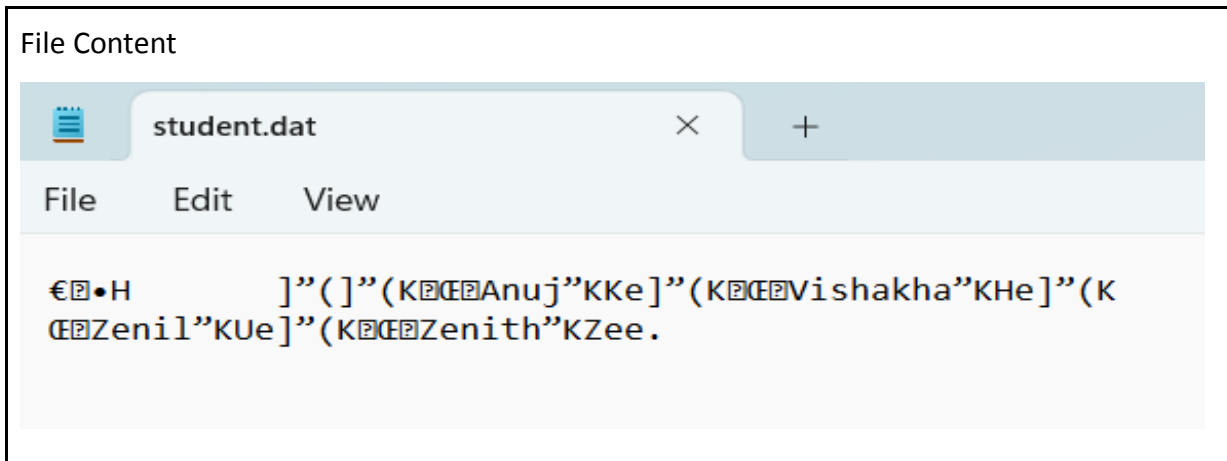
load( ): it is used to read data from binary file.

Syntax: identifier = pickle.load(file_pointer)

Example: data = pickle.load(f)   #Here 'data' is an identifier and 'f' is a file pointer.

```
#Write a program to read data from city.bin
import pickle
f=open("city.bin","rb")
city=pickle.load(f)
print("City Names are : ",city)
f.close()
```

```
>>>
== RESTART: C:/Users/anujd/AppData/Local/Programs/Python/Pythor
City Names are :  ['Delhi', 'Mumbai', 'Kolkata', 'Chennai']
>>>
```

```
#Write a program in python to read
#student details from a binary file named "student.dat"

import pickle
f=open("student.dat","rb")
record=pickle.load(f) #record contains the whole content of file
for i in record:    #accessing records one by one
    print(i)
f.close()
```

```
>>>
== RESTART: C:/Users/anujd/AppI
[1, 'Anuj', 75]
[2, 'Vishakha', 72]
[10, 'Zenil', 85]
[15, 'Zenith', 90]
>>>
```

Question: Write a menu based program in python which contain student details in binary file and should have following facilities:

1. Writing student details.
2. Display all students' details
3. Search particular student details
4. Update any student details
5. Delete any student details
6. Exit

```python
import pickle
import os

def insert():
    f=open("student.dat","ab")
    roll_no=int(input("Enter the Roll Number : "))
    name=input("Enter the Name : ")
    marks=int(input("Enter the Marks : "))
    student={"Roll_No":roll_no,"Name":name,"Marks":marks}
    pickle.dump(student,f)
    f.close()
    print("student details inserted successfully\n")

def display():
    f=open("student.dat","rb")
    try:
        while True:
            student=pickle.load(f)
            print(student)
    except:
        f.close()

def search():
    f=open("student.dat","rb")
    r=int(input("Enter the Roll Number to be searched : "))
    counter=0
```

```python
    try:
        while True:
            student = pickle.load(f)
            if student["Roll_No"] == r:
                print("Student Details:")
                print("Roll Number:", student["Roll_No"])
                print("Name:", student["Name"])
                print("Marks:", student["Marks"])
                counter=1
    except:
        pass
    finally:
        if counter==0:
            print("Student Not Found")
        f.close()

def update():
    f=open("student.dat","rb")
    r = int(input("Enter Roll Number to update: "))
    temp_file = open("temp.dat", "wb")

    try:
        while True:
            student = pickle.load(f)
            if student["Roll_No"] == r:
                print("Current Details:")
                print("Roll Number:", student["Roll_No"])
                print("Name:", student["Name"])
                print("Marks:", student["Marks"])
                name = input("Enter The New Name: ")
                marks = int(input("Enter The New Marks: "))
                student["Name"] = name
                student["Marks"] = marks
                pickle.dump(student, temp_file)
                print("Student details updated successfully.")
            else:
                pickle.dump(student, temp_file)
    except :
        pass
    finally:
        f.close()
        temp_file.close()
        os.remove("student.dat")
        os.rename("temp.dat", "student.dat")

def delete():
    f=open("student.dat","rb")
    r = int(input("Enter The Roll Number to be deleted: "))
    temp_file = open("temp.dat", "wb")

    try:
        while True:
```

```
                student = pickle.load(f)
                if student["Roll_No"] != r:
                    pickle.dump(student, temp_file)
        except EOFError:
            pass
        finally:
            f.close()
            temp_file.close()
            os.remove("student.dat")
            os.rename("temp.dat", "student.dat")
            print("Student deleted successfully.")

ch='y'
while ch in "yY":
    print("\nMenu:")
    print("1. Insert Student Details")
    print("2. Display All Students Details")
    print("3. Search Student Details")
    print("4. Update Student Details")
    print("5. Delete Student Details")
    print("6. Exit\n")
    choice=int(input("Enter your choice : "))
    if choice==1:
        insert()
    elif choice==2:
        display()
    elif choice==3:
        search()
    elif choice==4:
        update()
    elif choice==5:
        delete()
    elif choice==6:
        print("\n\t------ THE END --------")
        break
    else:
        print("\n\t------ Invalid Choice ------")
    ch=input("\nPress 'y' if you want to continue again : ")
```
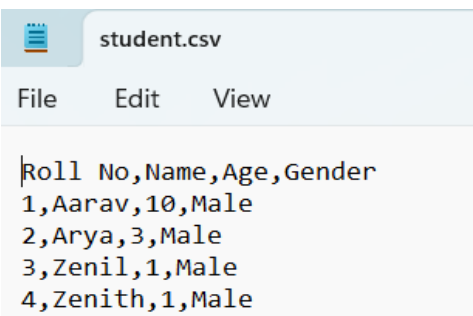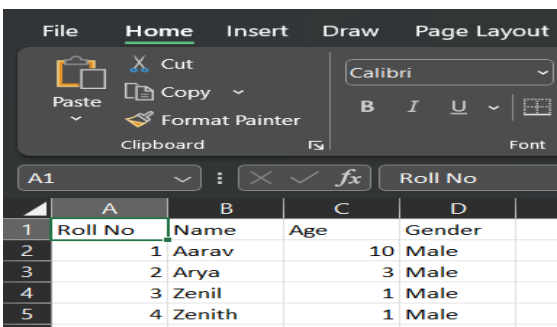
Comma Separated Value (CSV) Files:

1. It is a plain text file which stores data in a tabular format, where each row represents a record and each column represents a field and fields are separated by comma in csv files.
2. csv module is used for working with csv files
   a. import csv
3. File extension for csv file will be .csv
4. CSV module provides two main classes for working with csv files are:

a. reader

b. writer

5. CSV reader object can be used to iterate through the rows of the CSV file.

6. CSV writer object that can be used to write row(s) to the CSV file.

    a. writerow(): This method is used to write a single row to the CSV file.

    b. writerows(): This method is used to write multiple rows to the CSV file.

7. We can read csv file data in excel file also.

1. Reader Function:

    a. For reading data from csv file we require **csv. reader( )** function.

2. Writer Function:

    a. For writing data to the csv file we take a file object as input and write the data into the file.

    b. **writerow( )**: It writes a single row of data to the CSV file.

    c. **writerows( )**: It writes a list of rows of data to the CSV file.

WRITING INTO CSV FILES

Code:	Output in IDLE:
```python import csv f=open("student.csv","w",newline="") data=csv.writer(f) data.writerow(["Roll No","Name","Age","Gender"]) data.writerow([1,"Aarav",10,"Male"]) data.writerow([2,"Arya",3,"Male"]) data.writerow([3,"Zenil",1,"Male"]) data.writerow([4,"Zenith",1,"Male"]) print("Data Inserted Successfully") f.close() ```	>>>` `== RESTART: C:/Users/anujd/ Data Inserted Successfully >>>
Result in Notepad:	**Result in Excel:**
student.csv File Edit View Roll No,Name,Age,Gender 1,Aarav,10,Male 2,Arya,3,Male 3,Zenil,1,Male 4,Zenith,1,Male	

Code:

```
import csv
f=open("student.csv","w",newline="")
data=csv.writer(f)
data.writerow(["Roll No","Name","Age","Gender"])
data.writerows([[1,"Inderjeet",26,"Male"],
               [2,"Dushyant",23,"Male"],
               [3,"Kunal",22,"Male"],
               [4,"Chaman",19,"Male"]])
print("Data Inserted Successfully")
f.close()
```

Output in IDLE:

```
IDLE Shell 3.11.2
File  Edit  Shell  Debug  Options  Window  Help
    Python 3.11.2 (tags/v3.11.2:878ead1,
    AMD64)] on win32
    Type "help", "copyright", "credits" o
>>>
    == RESTART: C:\Users\anujd\AppData\Lo
    Data Inserted Successfully
>>>
```

Result in Notepad:

```
student.csv
File    Edit    View

Roll No,Name,Age,Gender
1,Inderjeet,26,Male
2,Dushyant,23,Male
3,Kunal,22,Male
4,Chaman,19,Male
```

Result in Excel:

	A	B	C	D	E
1	Roll No	Name	Age	Gender	
2	1	Inderjeet	26	Male	
3	2	Dushyant	23	Male	
4	3	Kunal	22	Male	
5	4	Chaman	19	Male	
6					

Code:

```
import csv
f=open("student.csv","w",newline="")
data=csv.writer(f)
data.writerow(["Roll No","Name","Age","Gender"])
ch="y"
details=[]
while ch in "yY":
    rno=int(input("Enter the Roll NO: "))
    name=input("Enter the Name : ")
    age=int(input("Enter the Age : "))
    gender=input("Enter the Gender : ")
    info=[rno,name,age,gender]
    details.append(info)
    ch=input("Press 'Y' if you want to continue: ")
data.writerows(details)
print("Data Inserted Successfully")
f.close()
```

Output in IDLE:

```
== RESTART: C:/Users/anujd/AppData/Local/Pro
Enter the Roll NO: 1
Enter the Name : Muskan
Enter the Age : 16
Enter the Gender : Female
Press 'Y' if you want to continue: y
Enter the Roll NO: 2
Enter the Name : Jatin
Enter the Age : 14
Enter the Gender : Male
Press 'Y' if you want to continue: y
Enter the Roll NO: 3
Enter the Name : Harshit
Enter the Age : 10
Enter the Gender : Male
Press 'Y' if you want to continue: y
Enter the Roll NO: 4
Enter the Name : Dakshit
Enter the Age : 6
Enter the Gender : Male
Press 'Y' if you want to continue: n
Data Inserted Successfully
```

Result in Notepad:
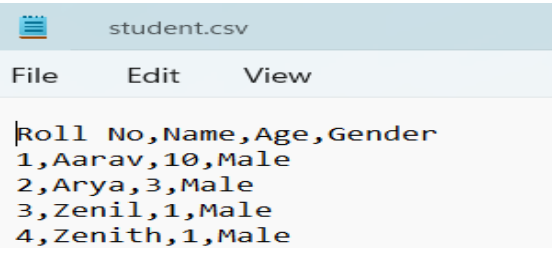
```
student.csv
File    Edit    View

Roll No,Name,Age,Gender
1,Muskan,16,Female
2,Jatin,14,Male
3,Harshit,10,Male
4,Dakshit,6,Male
```

Result in Excel:

	A	B	C	D	E
1	Roll No	Name	Age	Gender	
2	1	Muskan	16	Female	
3	2	Jatin	14	Male	
4	3	Harshit	10	Male	
5	4	Dakshit	6	Male	

READING FROM CSV FILES

File Content:

```
student.csv
File    Edit    View

Roll No,Name,Age,Gender
1,Aarav,10,Male
2,Arya,3,Male
3,Zenil,1,Male
4,Zenith,1,Male
```

Code: To read all records of csv file

```python
import csv
f=open("student.csv","r")
data=csv.reader(f)
for i in data:
    print(i)
```

Output:

```
== RESTART: C:/Users/anujd/AppData/L
['Roll No', 'Name', 'Age', 'Gender']
['1', 'Aarav', '10', 'Male']
['2', 'Arya', '3', 'Male']
['3', 'Zenil', '1', 'Male']
['4', 'Zenith', '1', 'Male']
>>>
```

Code: To display all the records in which name starts with 'A'

```python
import csv
f=open("student.csv","r")
data=csv.reader(f)
for i in data:
    if i[1][0] in "aA":
        print(i)
```

Output:

```
== RESTART: C:/Users/anujd/A
['1', 'Aarav', '10', 'Male']
['2', 'Arya', '3', 'Male']
>>>
```

ABSOLUTE AND RELATIVE PATH:

1. Absolute path is a path that starts from the root directory of the file system or we can say that it describes how to access a given file or directory, from the starting of the file system.
2. Relative path is a path that is relative to the current working directory or we can say that is interpreted from the perspective of the current working directory.
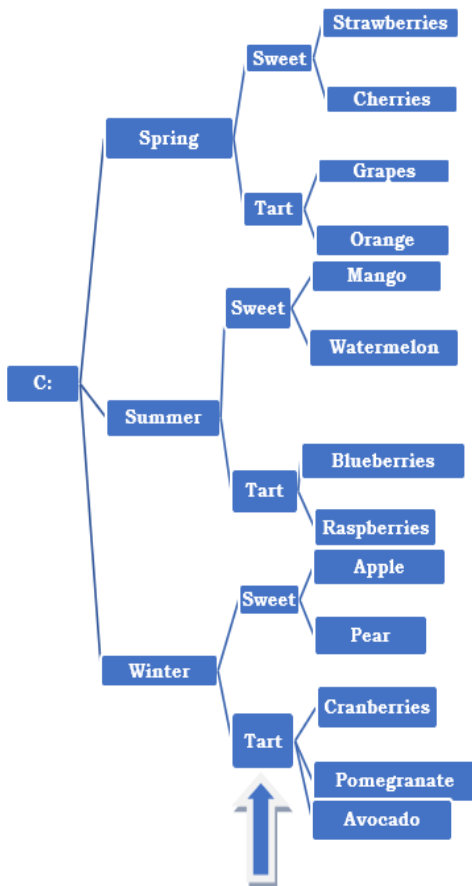
Relative Path	Absolute Path
..\..\Spring\Sweet\Strawberries	C:\Spring\Sweet\Strawberries
..\..\Spring\Sweet	C:\Spring\Sweet
..\..\Spring\Sweet\Cherries	C:\Spring\Sweet\Cherries
..\..\Spring	C:\Spring
..\..\Spring\Tart\Grapes	C:\Spring\Tart\Grapes
..\..\Spring\Tart\	C:\Spring\Tart
..\..\Spring\Tart\Orange	C:\Spring\Tart\Orange
..\..\Spring\Sweet\Mango	C:\Summer\Sweet\Mango
..\..\Spring\Sweet	C:\Summer\Sweet
..\..\Spring\Sweet\Watermelon	C:\Summer\Sweet\Watermelon
..\..	C:
..\..\Summer	C:\Summer
..\..\Summer\Tart\Blueberries	C:\Summer\Tart\Blueberries
..\..\Summer\Tart	C:\Summer\Tart
..\..\Summer\Tart\Raspberries	C:\Summer\Tart\Raspberries
..\Sweet\Apple	C:\Winter\Sweet\Apple
..\Sweet	C:\Winter\Sweet
..\Sweet\Pear	C:\Winter\Sweet\Pear
..	C:\Winter
Cranberries	C:\Winter\Tart\Cranberries
.	C:\Winter\Tart
Pomegranate	C:\Winter\Tart\Pomegranate
Avocado	C:\Winter\Tart\Avocado

In this current working directory is: C:\Winter\Tart

Questions

1. Write a statement to send the file pointer position 10 bytes forward from current location of file ,consider fp as file object.
   a) fp.seek(10)   b) fp.seek(10,1)   c) fp.tell(10)   d) fp.seek(1,10)

2. Which function is used to open a file in Python?
   a. open()   b. read()   c. write()   d. close()

3. Which of the following mode in file opening statement results or generates an error if the file does not exist?
    a) a+   b) r+   c) w+   d) None of the above

4. If the csv file 'item.csv' has a header and 3 records in 3 rows and we want to display only the header after opening the file with open() function, we should write
      a). print(file.readlines())
      b). print(file.read())
      c) print(file.readline())
      d). print(file.header())

5. Identify the missing part in the code to write the list object in the file
       >>> import pickle
       >>> x=[1,3,5,7]
       >>> f=open('w.dat','wb')
        >>> pickle._____(x,f)
       >>> f.close()
   a). write()   b). writeline()   c). load()   d). dump()

6. Which of the following statements are True
      (a) When you open a file for reading, if the file does not exist, an error occurs
      (b) When you open a file for writing, if the file does not exist, a new file is created
      (c) When you open a file for writing, if the file exists, the existing file is overwritten with the new file
      (d) All of the mentioned

7. Write a statement to send the file pointer position 10 bytes forward from current location of file , consider fp as file object.
   a) fp.seek(10)   b) fp.seek(10,1)   c) fp.tell(10)   d) fp.seek(1,10)

8. myfile.txt is a file stored in the working directory. Total number of characters including spaces are 106 and there are 5 lines. What will be the output of len(file.readlines()) after the file was opened as file=open('myfile.txt')
   a). 4   b). 106   c). 5   d). 1

9. Which of the following option is not correct?
    a. if we try to read a text file that does not exist, an error occurs.
    b. if we try to read a text file that does not exist, the file gets created.

c. if we try to write on a text file that does not exist, no error occurs.
d. if we try to write on a text file that does not exist, the file gets Created.

10. A text file readme.txt is opened in Python. What type of data is stored in f?
    >>> file=open('readme.txt')
    >>> f=file.readlines()

    a). String   b). Tuple   c). List   d). None of the above

11. Find P and Q from the options while performing object serialization
    >>> import pickle
    >>> spc=open("yoyo.dat","wb")
    >>> x=500
    >>> pickle.dump(P,Q)
    a). x,spc   b). spc, x   c). 'yoyo.dat',500   d). 'yoyo.dat','500'

12. A text file myfile0.txt has two lines of text, what will be stored in the variable ctr when the following code is executed?
    >>> ctr=0
    >>> spc=open("myfile0.txt")
    >>> while(spc.readline()):
                ctr += 1
    a). 0   b). 1   c). 2   d). 3

13. How many lines does the file myfile00.txt has after the code is executed?
    >>> mylist=['India', '\nis', '\nmy', '\ncountry', '\nand', '\nI', '\nam', '\na', '\nproud', '\ncitizen']
    >>> spc=open("myfile00.txt","w")
    >>> spc.writelines(mylist)
    a). 2   b). 10   c). 9   d). 1

14. Which of the following options can be used to read the first line of a text file Myfile.txt?
    a. myfile = open('Myfile.txt'); myfile.read()
    b. myfile = open('Myfile.txt','r'); myfile.read(n)
    c. myfile = open('Myfile.txt'); myfile.readline()
    d. myfile = open('Myfile.txt'); myfile.readlines()

15. Assume that the position of the file pointer is at the beginning of 3rd line in a text file. Which of the following option can be used to read all the remaining lines?
    a). myfile.read()   b). myfile.read(n)   c). myfile.readline()   d). myfile.readlines()

16. A text file student.txt is stored in the storage device. Identify the correct option out of the following options to open the file in read mode.
    i. myfile = open('student.txt','rb')
    ii. myfile = open('student.txt','w')
    iii. myfile = open('student.txt','r')
    iv. myfile = open('student.txt')

a).   only i   b). both i and iv   c). both iii and iv   d). both i and iii

17.   Which of the following statement is incorrect in the context of binary files?
       a) Information is stored in the same format in which the information is held in memory.
       b) No character translation takes place
       c) Every line ends with a new line character
       d) pickle module is used for reading and writing

18.   Which of the following options can be used to read the first line of a text file Myfile.txt?
       a) myfile = open('Myfile.txt'); myfile.read()
       b) myfile = open('Myfile.txt','r'); myfile.read(n)
       c) myfile = open('Myfile.txt'); myfile.readline()
       d) myfile = open('Myfile.txt'); myfile.readlines()

19.   Which of the following statement is incorrect in the context of binary files?
       a) Information is stored in the same format in which the information is held in memory.
       b) No character translation takes place
       c) Every line ends with a new line character
       d) pickle module is used for reading and writing

20.   Which of the following statement is true?
       a) pickling creates an object from a sequence of bytes
       b) pickling is used for object serialization
       c) pickling is used for object deserialization
       d) pickling is used to manage all types of files in Python

21.   Syntax of seek function in Python is myfile.seek(offset, reference_point) where myfile is the file object. What is the default value of reference_point?
       a) 0   b)   1   c)   2   d) 3

22.   Which of the following character acts as default delimiter in a csv file?
       a) (colon) :   b) (hyphen) -   c) (comma) ,   d) (vertical line) |

23.   Syntax for opening a Student.csv file in write mode is myfile = open("Student.csv","w",newline=''). What is the importance of newline=''?
       a) A newline gets added to the file
       b) Empty string gets appended to the first line.
       c) Empty string gets appended to all lines.
       d) EOL translation is suppressed

24.   What is the correct expansion of CSV files?
       a) Comma Separable Values
       b) Comma Separated Values
       c) Comma Split Values

d) Comma Separation Values

25. Which of the following is not a function / method of csv module in Python?
    a) read()   b) reader()   c) writer()   d) writerow()

26. Which of the following statement opens a binary file record.bin in write mode and writes data from a list
    lst1 = [1,2,3,4] on the binary file?
    a) with open('record.bin','wb') as myfile:
                pickle.dump(lst1,myfile)
    b)with open('record.bin','wb') as myfile:
                pickle.dump(myfile,lst1)
    c) with open('record.bin','wb+') as myfile:
                pickle.dump(myfile,lst1)
    d) with open('record.bin','ab') as myfile:
                pickle.dump(myfile,lst1)

27. Which of the following functions changes the position of file pointer and returns its new position?
    a) flush()   b) tell()   c) seek()   d) offset()

28. Suppose content of 'Myfile.txt' is:

    Twinkle twinkle little star
    How I wonder what you are
    Up above the world so high
    Like a diamond in the sky

    What will be the output of the following code?

    myfile = open("Myfile.txt")
    data = myfile.readlines()
    print(len(data))
    myfile.close()

     a) 3   b) 4   c) 5   d) 6

29. Identify the missing part in the code to write the list object in the file
    >>> import pickle
    >>> x=[1,3,5,7]
     >>> f=open('w.dat','wb')
    >>> pickle._____(x,f)
    >>> f.close()
    a) write()   b) writeline()   c) load()   d) dump()

30. What is the significance of the tell() method?
    a) tells the path of file

b) tells the current position of the file pointer within the file

c) tells the end position within the file

d) checks the existence of a file at the desired location

31. If the csv file 'item.csv' has a header and 3 records in 3 rows and we want to display only the header after opening the file with open() function, we should write

a). print(file.readlines())

b). print(file.read())

c). print(file.readline())

d). print(file.header())

32. The syntax of seek() is :

file_object.seek(offset [, reference_point]) What is the default value of reference_point?

a) 0 b) 1 c) 2 d) 3

33. Assume the content of text file, 'student.txt' is:

Arjun Kumar

Ismail Khan

Joseph B

Hanika Kiran

What will be the data type of data_rec?

myfile = open("Myfile.txt")

data_rec = myfile.readlines()

myfile.close()

a) string b) list c) tuple d) dictionary

34. Mr. Manish Kumar is writing a program to create a CSV file "user.csv" which will contain user name and password for some entries. He has written the following code. As a programmer, help him to successfully execute the given task.

```
import _____   # Line 1
def addCsvFile(UserName,PassWord): # to write / add data into the CSV file
    f=open(' user.csv','_____') # Line 2

    #csv file reading code
def readCsvFile(): # to read data from CSV file with
    open(' user.csv','r') as newFile:
        newFileReader = csv._____(newFile) # Line 3
        for row in newFileReader:
            print (row[0],row[1])
            newFile._____   # Line 4
addCsvFile("Arjun","123@456")
addCsvFile("Arunima","aru@nima")
addCsvFile("Frieda","myname@FRD")
readCsvFile() #Line 5
```

a) Name the module he should import in Line 1.

b) In which mode, Manish should open the file to add data into the file

c) Fill in the blank in Line 3 to read the data from a csv file.

d) Fill in the blank in Line 4 to close the file.

e) Write the output he will obtain while executing Line 5.

35.	Roshni of class 12 is writing a program in Python for her project work to create a CSV file "Teachers.csv" which will contain information for every teacher's identification Number , Name for some entries.She has written the following code.However, she is unable to figure out the correct statements in few lines of code,hence she has left them blank. Help her write the statements correctly for the missing parts in the code.

```
import _____                                          # Line 1

def addrec(Idno, Name): # to add record into the CSV file

     f=open("Teachers.csv", _____)                    # Line 2

     Filewriter = CSV.writer(f)

     Filewriter.writerow([Idno,name])

     f.close()

def readfile(): # to read the data from CSV file

     f=open("Teachers.csv", _____)                     # Line 3

     FileReader = CSV._____ (f)                         # Line 4

     for row in FileReader:

             print(row)

     f._____                                          # Line 5
```

36.	Rohit, a student of class 12, is learning CSV File Module in Python. During the examination, he has been assigned an incomplete python code (shown below) to create a CSV File 'Student.csv' (content shown below). Help him in completing the code which creates the desired CSV File.

```
CSV File
1,AKSHAY,XII,A
2,ABHISHEK,XII,A
3,ARVIND,XII,A
4,RAVI,XII,A
5,ASHISH,XII,A
```

Help him complete the below code:

Incomplete Code

```
import _____                                          #Statement-1
fh = open(_____, _____, newline='')                  #Statement-2
stuwriter = csv._____                                 #Statement-3
data = [ ]
header = ['ROLL_NO', 'NAME', 'CLASS', 'SECTION']
data.append(header)
for i in range(5):
        roll_no = int(input("Enter Roll Number : "))
        name = input("Enter Name : ")
        Class =  input("Enter Class : ")
        section =  input("Enter Section : ")
        rec = [ _____ ]                                #Statement-4
        data.append(_____)                            #Statement-5
stuwriter. _____ (data)                               #Statement-6
fh.close()
```

37. Write the definition of a function Change Gender() in Python, which reads the contents of a text file "BIOPIC. TXT" and displays the content of the file with every occurrence of the word 'he replaced by 'she. For example, if the content of the file "BIOPIC. TXT" is as follows:

    Last time he went to Agra, there was too much crowd, which he did not like. So this time he decided to visit some hill station.

    The function should read the file content and display the output as follows:

    Last time she went to Agra, there was too much crowd, which she did not like. So this time she decided to visit some hill station.

38. Ranjan Kumar of class 12 is writing a program to create a CSV file "user.csv" which will contain user name and password for some entries. He has written the following code. As a programmer, help him to successfully execute the given task.

    ```
    import _____ # Line 1
    def addCsvFile(UserName,PassWord): # to write / add data into the CSV file
        f=open(' user.csv','_____') # Line 2
        newFileWriter = csv.writer(f)
        newFileWriter.writerow([UserName,PassWord])
        f.close()
    #csv file reading code
    def readCsvFile(): # to read data from CSV file
        with open(' user.csv','r') as newFile:
            newFileReader = csv._____(newFile)# Line 3
            for row in newFileReader:
                print (row[0],row[1])
        newFile._____ # Line 4
    addCsvFile("Arjun","123@456")
    addCsvFile("Arunima","aru@nima")
    addCsvFile("Frieda","myname@FRD")
    readCsvFile() #Line 5
    ```

(a) Name the module he should import in Line 1.
(b) In which mode, Ranjan should open the file to add data into the file in line 2.
(c) Fill in the blank in Line 3 to read the data from a csv file.
(d) Fill in the blank in Line 4 to close the file.
(e) Write the output he will obtain while executing Line 5.

39. Which of the following modes is used for both writing and reading from a binary file?
    a) wb+   b) w   c) wb   d) w+

40. The correct syntax of read() function from text files is:
    a) file_object.read()   b. file_object(read)   c. read(file_object)   d. file_object().read

41. What are the three modes in which a file can be opened in Python?
    a) r, w, and a   b. r+, w+, and a+   c. rb, wb, and ab   d. All of the above

42. What mode should be used to open a file for reading only?
    a). r   b.) w   c.) a   d.) r+

43. What mode should be used to open a file for writing only?
    a.) r   b.) w   c.) a   d.) w+

44. What mode should be used to open a file for appending data?
    a.) r   b.) w   c.) a   d.) a+

45. Which mode is used for both reading and writing in a file?
    a) . r+   b.) w+   c.) a+   d.) x+

46. Which method is used to read data from a file in Python?
    a. read()   b. write()   c. seek()   d. close()

47. Which method is used to write data to a file in Python?
    a. read()   b. write()   c. seek()   d. close()

48. Which method is used to move the file pointer to a specific position in a file in Python?
    a. read()   b. write()   c. seek()   d. close()

49. Which method is used to close a file in Python?
    a. read()   b. write()   c. seek()   d. close()

50. What is the default mode in which a file is opened in Python?
    a. r   b. w   c. a   d. None of the above

51. How do you read a specific number of bytes from a binary file in Python?
    a. read()   b. read_bytes()   c. read(n)   d. readlines(n)

52. What is the difference between a text file and a binary file?
a. Text files contain characters, while binary files contain arbitrary data.
b. Text files are human-readable, while binary files are not.
c. Text files are encoded using a character set, while binary files are not.
d. All of the above

53. What is the difference between the read() and readline() methods in Python?
a. The read() method reads all of the data from a file, while the readline() method reads only one line of data at a time.
b. The read() method returns a string, while the readline() method returns a list of strings.
c. The read() method does not move the file pointer, while the readline() method moves the file pointer to the next line.
d. All of the above

54. What is the difference between the write() and writelines() methods in Python?
a. The write() method writes a single string to a file, while the writelines() method writes a list of strings to a file.
b. The write() method does not append a newline character to the end of the string, while the writelines() method does.
c. The write() method moves the file pointer to the next position, while the writelines() method does not.
d. All of the above

55. What is the difference between the seek() and tell() methods in Python?
a. The seek() method moves the file pointer to a specific position in a file, while the tell() method returns the current position of the file pointer.
b. The seek() method takes an offset and a mode as arguments, while the tell() method does not.
c. The seek() method can move the file pointer to a position before the beginning of the file, while the tell() method cannot.
d. All of the above

56. What is the purpose of file handling in Python?
a. To store data permanently
b. To perform mathematical operations on files
c. To create graphical user interfaces
d. To handle network connections

57. What happens if you try to open a file in 'w' mode that already exists?
a. It overwrites the existing file.
b. It raises a FileNotFoundError.
c. It appends data to the existing file.
d. It creates a backup of the existing file.

58. What is the purpose of the 'with' statement in file handling?
a. It is used for creating new files.
b. It automatically closes the file when done.

c. It is used for reading binary files.

d. It is used for appending data to files.

59. What is the purpose of the 'tell()' method in file handling?

a. It tells you the size of the file.

b. It returns the current cursor position.

c. It tells you the number of lines in the file.

d. It returns the file's modification time.

60. What is the purpose of the 'os' module in file handling?

a. It provides functions for file operations.

b. It is used for performing mathematical operations.

c. It handles network connections.

d. It creates graphical user interfaces.

61. Which method is used to delete a file in Python?

a. os.delete()   b. os.remove()   c. file.delete()   d. file.remove()

62. Which method is used to rename a file in Python?

a. os.delete()   b. os.remove()   c. file.delete()   d. file.remove()

63. What happens if you try to open a non-existent file in Python using 'r' mode?

a. It raises a FileNotFoundError

b. It creates an empty file

c. It raises an IOError

d. It opens a file in read mode

64. How can you check if a file exists in Python before trying to open it?

a. Using the os module

b. Using the file.exists() method

c. Using the file.exist() method

d. Using the file.open() method

65. What is the difference between 'rb' and 'r' when opening a file in Python?

a. 'rb' opens the file in binary mode, 'r' in text mode

b. 'rb' reads the file backward, 'r' reads it forward

c. 'rb' is for reading, 'r' is for writing

d. 'rb' and 'r' are the same

66. Which character is used as the path separator in Python?

a. /   b. \   c. :   d. ,

67. What does CSV stand for?

a. Comma-Separated Values

b. Computer System Variables

c. Centralized Storage Values

d. Common String Values

68. Which module in Python is used to read and write CSV files?
    a. os
    b. csv
    c. fileio
    d. csvio

69. How can you read a CSV file in Python using the `csv` module?
    a. csv.read(file)
    b. csv.reader(file)
    c. csv.load(file)
    d. csv.load_csv(file)

70. What function is used to write data to a CSV file using the `csv` module in Python?
    a. csv.write()
    b. csv.writer()
    c. csv.write_csv()
    d. csv.write_to_file()

71. In a CSV file, how are values typically separated?
    a. By commas (`,`)
    b. By spaces (``)
    c. By semicolons (`;`)
    d. By tabs (`\t`)

72. How can you write a dictionary to a CSV file using the `csv` module in Python?
    a. csv.write_dict()
    b. csv.writerows()
    c. csv.writer_dict()
    d. csv.DictWriter()

73. Which of the following statements is true about reading a CSV file with the `csv` module in Python?
    a. Each row is returned as a list of strings
    b. Each row is returned as a dictionary
    c. Each column is returned as a separate value
    d. CSV files cannot be read using the `csv` module

74. Raghav is trying to write a tuple tup1 = (1,2,3,4,5) on a binary file test.bin. Consider the following code written by him.
     import pickle
     tup1 = (1,2,3,4,5)
    myfile = open("test.bin",'wb')
    pickle._____ #Statement 1 myfile.close()
     Write the missing code in Statement 1

75. A binary file employee.dat has following data

Empno	empname	Salary
101	Anuj	50000
102	Arijita	40000
103	Hanika	30000
104	Firoz	60000
105	Vijaylakshmi	40000

```
def display(eno):
        f=open("employee.dat","rb")
        totSum=0
        try:
                while True:
                        R=pickle.load(f)
                        if R[0]==eno:
                                _____ #Line1
                        totSum=totSum+R[2]
            except:
                f.close()
                print(totSum)
```

When the above mentioned function, display (103) is executed, the output displayed is 190000. Write appropriate jump statement from the following to obtain the above output.

76. Suppose content of 'Myfile.txt' is:
    Honesty is the best policy.
    What will be the output of the following code?
    ```
    myfile = open("Myfile.txt")
    x = myfile.read()
    print(len(x))
    myfile.close()
    ```

77. Suppose content of 'Myfile.txt' is
    Culture is the widening of the mind and of the spirit.
    What will be the output of the following code?

    ```
    myfile = open("Myfile.txt")
    x = myfile.read()
    y = x.count('the')
    print(y)
    myfile.close()
    ```

78. Suppose content of 'Myfile.txt' is

    Humpty Dumpty sat on a wall
    Humpty Dumpty had a great fall

All the king's horses and all the king's men
Couldn't put Humpty together again

What will be the output of the following code?
```
myfile = open("Myfile.txt")
record = myfile.read().split()
print(len(record))
myfile.close()
```

79. Suppose content of 'Myfile.txt' is

    Ek Bharat Shreshtha Bharat
    What will be the output of the following code?
    ```
    myfile = open("Myfile.txt")
    vlist = list("aeiouAEIOU")
    vc=0
    x = myfile.read()
    for y in x:
        if(y in vlist):
            vc+=1
    print(vc)
    myfile.close()
    ```

80. Consider the following directory structure.
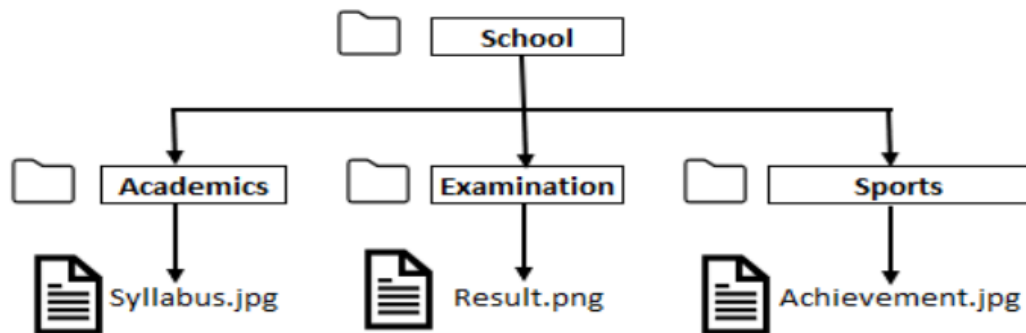
    Suppose root directory (School) and present working directory are the same. What will be the absolute path of the file Syllabus.jpg?
    a) School/syllabus.jpg
    b) School/Academics/syllabus.jpg
    c) School/Academics/../syllabus.jpg
    d) School/Examination/syllabus.jpg

81. A binary file "STUDENT.DAT" has structure (admission_number, Name, Percentage). Write a function countrec() in Python that would read contents of the file "STUDENT.DAT" and display the details of those students whose percentage is above 75. Also display number of students scoring above 75%

82. A binary file "Book.dat" has structure [BookNo, Book_Name, Author, Price]. i. Write a user defined function CreateFile() to input data for a record and add to Book.dat . ii. Write

a function CountRec(Author) in Python which accepts the Author name as parameter and count and return number of books by the given Author are stored in the binary file "Book.dat"

83. Write a function in Python that counts the number of "Me" or "My" words present in a text file "STORY.TXT". If the "STORY.TXT" contents are as follows:
     My first book was
     Me and My Family.
     It gave me chance to be
     Known to the world.

     The output of the function should be: Count of Me/My in file: 4

84. Write a function AMCount() in Python, which should read each character of a text file STORY.TXT, should count and display the occurance of alphabets A and M (including small cases a and m too).
     Example: If the file content is as follows:

     Updated information As simplified by official websites.
     The EUCount() function should display the output as:
     A or a:4
     M or m :2

85. Write a function in python to count the number of lines in a text file 'STORY.TXT' which is starting with an alphabet 'A' .

86. Write a method/function DISPLAYWORDS() in python to read lines from a text file STORY.TXT, and display those words, which are less than 4 characters.

87. Write the definition of a function Count_Line() in Python, which should read each line of a text file "SHIVAJI.TXT" and count total number of lines present in text file. For example, if the content of the file "SHIVAJI.TXT" is as follows:
     Shivaji was born in the family of Bhonsle.
     He was devoted to his mother Jijabai.
     India at that time was under Muslim rule.
     The function should read the file content and display the output as follows:

     Total number of lines: 3

88. A binary file "PLANTS.dat" has structure (ID, NAME, PRICE).

     Write the definition of a function WRITEREC () in Python, to input data for records from the user and write them to the file PLANTS.dat.
     Write the definition of a function SHOWHIGH () in Python, which reads the records of PLANTS. dat and displays those records for which the PRICE is more than 500.

89. Write the definition of a Python function named LongLines ( ) which reads the contents

of a text file named 'LINES.TXT' and displays those lines from the file which have at least 10 words in it. For example, if the content of 'LINES.TXT' is as follows:

Once upon a time, there was a woodcutter
He lived in a little house in a beautiful, green wood.
One day, he was merrily chopping some wood.
He saw a little girl skipping through the woods, whistling happily.
The girl was followed by a big gray wolf.

Then the function should display output as :

He lived in a little house in a beautiful, green wood.
He saw a little girl skipping through the woods, whistling happily.

90.   Write a function count Words (in Python to count the words ending with a digit in a text file "Details.txt".
      Example:
      If the file content is as follows:

      On seat2 VIP1 will sit and
      On seat1 VVIP2 will be sitting

      Output will be:

      Number of words ending with a digit are 4

91.   A binary file "PATIENTS.dat" has structure (PID, NAME, DISEASE).

      Write the definition of a function countrec () in Python that would read contents of the file "PATIENTS.dat" and display the details of those patients who have the DISEASE as 'COVID-19'. The function should also display the total number of such patients whose DISEASE is 'COVID-19'.

92.   Devender Singh, the Principal in GSV school, is developing a school teachers data using the csv module in Python. He has partially developed the code as follows leaving out statements about which he is not very confident. The code also contains error in certain statements. Help him in completing the code to read the code the desired CSV File named "Teachers.csv"
      #CSV File Content
      ENO, NAME, SUBJECT
      E1, R.S. Hooda, Maths
      E2, Sumit Beniwal, Chemistry
      E3, Neetu Grover, Shorthand
      E4, Jitender Meena, Social Science
      E5, Samta Devi, Sanskrit
      E6, Preeti Saini, Domestic Science
      E7, Mayank, Computer Science

E8, Sanjiv Kala, Hindi

```
#incomplete Code With Errors
Import CSV                                  #Statement-1
With open(_____'_____'newline=' ') as File:   #Statement-2
    ER=csv.                                 #Statement-3
    for R in range(ER):                     #Statement-4
        If _____== 'Chemistry':             #Statement-5
            print(____'_____)               #Statement-6
```

Q1. Devender Singh gets an Error for the module name used in Statement 1. What should he write in place of CSV to import the correct module?
   a) File   b) csv   c) csv   d) pickle

Q2. Identify the missing code for blank spaces in the line marked as Statement-2 to open the mentioned file.
a.) "Teacher.csv","r"   b) "Teacher.csv","w"   c) "Teacher.csv","rb"   d)"Teacher.csv","wb"

Q3 Choose the function name (with parameter) that should be used in the line marked as Statement-3 .
   a) reader(File)   b) readrows(File)   c) writer(File)   d)"writerows(File)

Q4. Devender Singh gets an Error in Statement-4. What should he write to correct the statement?
   a) For R in ER: b) while R in range(ER):   c) for R = ER: d) while R = = ER:

Q5. Identify the suitable code for blank space in statement-5 to match every row's 3rd property with "Maths".
   a) ER[3]   b) ER[2]   c) R[2]   d) R[3]

Q6. Identify the suitable code for blank space in Statement-6 to display every Employee's Name and corresponding Department?
   a) ER[1],R[2]   b) R[1], ER[2]   c) R[1],R[2]   d) ER[1],ER[2]

---

93.   Shreyas is a programmer, who has recently been given a task to write a user defined function named write_bin() to create a binary file called Cust_file.dat containing customer information customer number (c_no), name (c_name), quantity (qty), price (price) and amount (amt) of each customer.

The function accepts customer number, name, quantity and price. Thereafter, it displays the message Quantity less than 10..... Cannot SAVE', if quantity entered is less than 10. Otherwise the function calculates amount as price quantity and then writes the record in the form of a list into the binary file.

```python
import pickle
def write_bin():
  bin_file=_____    #Statement 1
  while True:
    c_no=int(input("enter customer number"))
    c_name=input("enter customer name")
    qty=int(input("enter qty"))
    price=int(input("enter price"))
    if _____    #Statement 2
      print("Quantity less than 10..Cannot SAVE")
    else:
      amt=price * qty
      c_detail=[c_no,c_name,qty,price,amt]
      _____    #Statement 3
      ans=input("Do you wish to enter more records y/n")
      if ans.lower()=='n':
        _____    #Statement 4
  _____    #Statement 5
  _____    #Statement 6
```

i) Write the correct statement to open a file 'Cust_file.dat' for writing the data of the customer.

(ii) Which statement should Shreyas fill in Statement 2 to check whether quantity is less than 10.

(iii) Which statement should Shreyas fill in Statement 3 to write data to the binary file and in Statement 4 to stop further processing if the user does not wish to enter more records.

(iv) What should Shreyas fill in Statement 5 to close the binary file named Cust_file.dat and in Statement 6 to call a function to write data in binary file?

Data Structures

Topics to be covered

1. Stack
2. Operations on stack (push, pop, peek, display)
3. Implementation of stack using list
4. Applications of stack

DATA STRUCTURE

Data structure can be defined as a set of rules and operations to organize and store data in an efficient manner. We can also say that it is a way to store data in a structured way. We can apply different operations like reversal, slicing, counting etc. of different data structures. Hence, Data Structure is a way to organize multiple elements so that certain operations can be performed easily on whole data as a single unit as well as individually on each element also.

In Python, Users are allowed to create their own Data Structures which enable them to define the functionality of created data structures. Examples of User Defined data structures in Python are Stack, Queue, Tree, Linked List etc. There are some built-in data structures also available in Python like List, Tuple, Dictionary and Set.

Types of Data Structure:
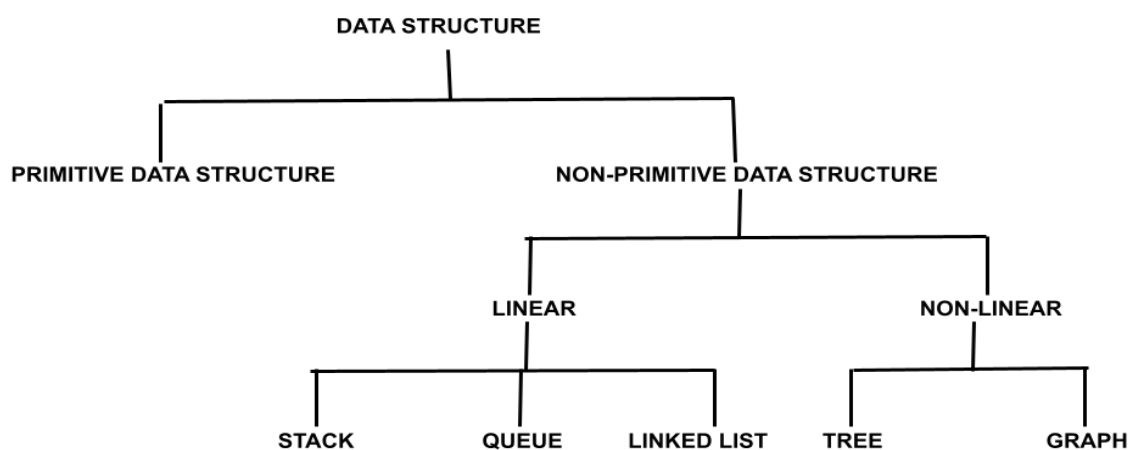
Primitive Data Structures

Primitive Data Structures contain simplified data values and are directly operated by machine level instructions. For example, integer, real, character etc. are primitive data structures.

Non-Primitive Data Structures

Non-Primitive Data Structures are derived from the primitive data structures. These are of two types: **Linear data structures,** that are single level data structures having their elements in a sequence like stack, queue and linked list while **Non-linear data structures** that are multilevel data structures like tree and graph.

STACK:

A Stack is a Linear data structure which works in LIFO (Last In First Out) manner (or we can say FILO i.e. First In Last Out manner). It means that Insertion and Deletion of elements will be done only from one end generally known as TOP only. In Python, we can use List data structure to implement Stack.
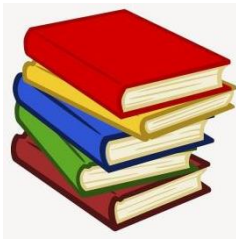
Application of Stack:

1. Expression Evaluation
2. String Reversal
3. Function Call
4. Browser History
5. Undo/Redo Operations

Operations of Stack:

The Stack supports following operations:

1. **Push:** It adds an element to the TOP of the Stack.
2. **Pop:** It removes an element from the TOP of the Stack.
3. **Peek:** It is used to know/display the value of TOP without removing it.
4. **isEmpty:** It is used to check whether Stack is empty.

OVERFLOW: It refers to the condition in which we try to PUSH an item in a Stack which is already FULL.

UNDERFLOW: It refers to the condition in which we are trying to POP an item from an empty Stack.
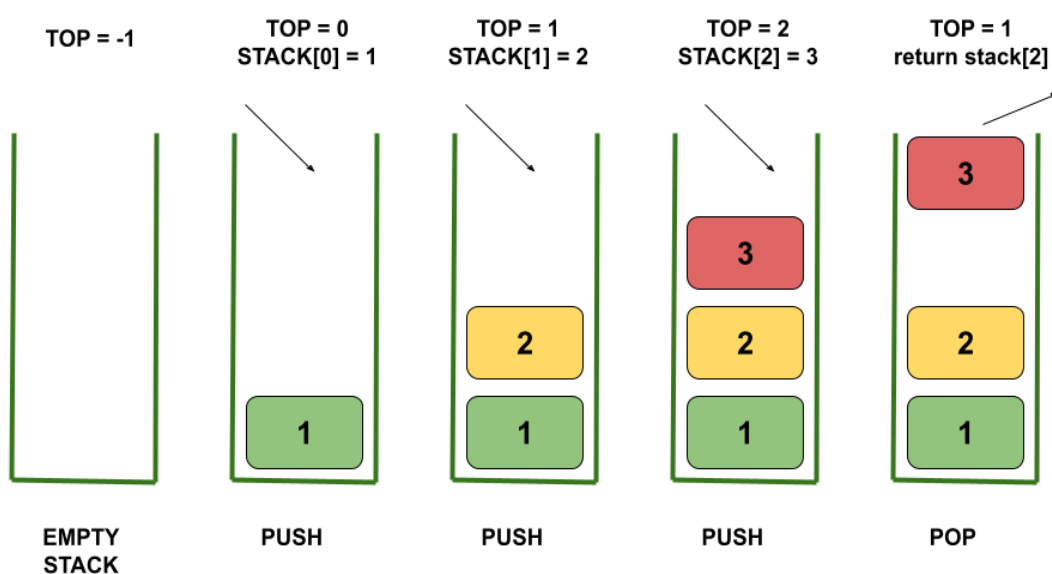
Implementation of Stack:

In Python, List data structure is used to implement Stack. For PUSH operation we use **append()** method of List while for POP operation we use **pop()** method of List.

PROGRAM: To illustrate the basic operations of Stack:

```python
def Push(emp,el): #method to add an element at TOP of stack
    top = len(emp) - 1
    emp.append(el)
    print(top)
    print("Data inserted successfully")
    return top
def Pop(emp):   #method to delete last element (TOP) of stack
    if isEmpty(emp):
        print("Stack is empty... Underflow Case")
    else:
        print("Deleted data is: ",emp.pop())
def Peek(emp): #method to display element at TOP
    if isEmpty(emp):
        print("Stack is empty...Nothing to Display")
    else:
        top = len(emp) - 1
        print("The last data added is: ",emp[top])

def Display(emp): #methjod to display stack
    if isEmpty(emp):
        print("Stack is empty... Nothing to Display")
    else:
        top = len(emp)
        d=emp[::-1]    #reversal of list done to display the TOP element first
        print("Data in stack is as follows: ")
        for i in d:
            print(i)

def isEmpty(emp):   #method to check stack is empty or not.
    if len(emp)==0:
        return True
    else:
        return False
```

```python
emp=[]
top=None
while True:
    print("Stack operations")
    print("1. Add employee data.")
    print("2. Delete employee data.")
    print("3. Display employee data.")
    print("4. Display last added data.")
    print("5. Exit")
    ch=int(input("Choose operation on stack:"))
    if ch==1:
        e_no=int(input("Enter employee number: "))
        e_name=input("Enter employee name: ")
        data=[e_no,e_name]
        Push(emp,data) #method calling
    elif ch==2:
        Pop(emp)
    elif ch==3:
        Display(emp)
    elif ch==4:
        Peek(emp)
    elif ch==5:
        break
    else:
        print("Invalid choice")
```

2. A list contains following record of customer: [CBSE EXAM 2022-23]

   [Customer_name, Room_type]

   Write the following user defined functions to perform given operations on the stack

named "Hotel":

i. Push_Cust() - To Push customer's names of those customers who are staying in 'Delux' Room Type.

ii. Pop_Cust() - To Pop the names of Customers from the stack and display them. Also, display "Underflow" when there are no customers in the stack.

For example: If the list with customer details are as follows:

["Siddarth", "Delux"]

["Rahul", "Standard"]

["Jerry", "Delux"]

The stack should contain:

Jerry

Siddharth

The output should be:

Jerry

Siiddharth

Underflow

```python
Hotel = []
Customer = [['Siddarth', 'Delux'], ['Rahul', 'Standard'], ['Jerry', 'Delux']]
def Push_Cust():
    for rec in Customer:
        if rec[1] == 'Delux':
            Hotel.append(rec[0])

def Pop_Cust():
    while len(Hotel) > 0:
        print(Hotel.pop())
    else:
        print("Underflow")

Push_Cust()
Pop_Cust()
```

3. Write a function, Push (Vehicle) where, Vehicle is a dictionary containing details of vehicles – {Car_Name: Maker}. The function should push the name of car manufactured by 'TATA' (including all the possible cases like Tata, TaTa, etc.) to the stack. For example:

If the dictionary contains the following data:

Vehicle = {'Santro': 'Hyundai', 'Nexon': 'TATA', 'Safari' : 'Tata'}

The stack should contain:

Safari

Nexon   [CBSE EXAM 2022-23]

```
stack=[]
Vehicle = {'Santro':'Hyundai', 'Nexon':'TATA', 'Safari':'Tata'}
def Push(Vehicle):
    for v_name in Vehicle:
        if Vehicle[v_name].upper() == 'TATA':
            stack.append(v_name)
Push(Vehicle)
x = stack[::-1]     #reversal to print stack
for i in x:
    print(i)
```

<p align="center">OR</p>

```
stack=[]
Vehicle = {'Santro':'Hyundai', 'Nexon':'TATA', 'Safari':'Tata'}
def Push(Vehicle):
    for v_name in Vehicle:
        if Vehicle[v_name] in ('TATA', 'TaTa', 'tata', 'Tata')
            stack.append(v_name)
Push(Vehicle)
x = stack[::-1]     #reversal to print stack
for i in x:
    print(i)
```

QUES: A list, NList, contains following record as list elements:

[City, Country, distance from Delhi]

Each of these records are nested together to form a nested list. Write the following user defined functions in Python to perform the specified operations on the stack named travel.
  i.   **Push_element(NList):** It takes the nested list as an argument and pushes a list object containing name of the city and country, which are not in India and distance is less than 3500 km from Delhi.
  ii. **Pop_element():** It pops the objects from the stack and displays them. Also, the function should display "Stack Empty" when there are no elements in the stack.
       For example: If the nested list contains the following data:
       NList=[["Newyork","USA",11734],   ["Naypyidaw",   "Myanmar",3219],
       ["Dubai","UAE",2194], ["London","England",6693], ["Gangtok", "India",1580], ["Columbo",
       "Sri Lanka", 3405]]
       The stack should contain:
       ["Naypyidaw", "Myanmar",3219], ["Dubai","UAE",2194], ["Columbo", "Sri Lanka", 3405]
       The output should be:
       ["Columbo", "Sri Lanka", 3405]
       ["Dubai","UAE",2194]
       ["Naypyidaw", "Myanmar",3219]
       Stack Empty   [CBSE SQP 2023]

```
travel = []
NList = [["New York","USA",11734], ['Naypyidaw','Myanmar',3219], ['Dubai','UAE',2194], ['London','England',6693],
         ['Gangtok', 'India',1580], ['Columbo', 'Sri Lanka', 3405]]

def Push_element(NList):
    for x in NList:
        if x[1] != 'India' and x[2] < 3500:
            travel.append([x[0],x[1]])
def Pop_element():
    while len(travel):
        print(travel.pop())
    else:
        print("Stack Empty")
Push_element(NList)
Pop_element()
```

Ques: Write a function in Python, Push(SItem) where, SItem is a dictionary containing the details of stationary items—{Sname:price}. The function should Push the names of those items in the stack who have price greater than 75. Also display the count of elements pushed into the stack.

For example:

If th dictionary contains the following data:

SItem: {'Pen': 106, 'Pencil': 59, 'Notebook': 80, 'Eraser':25}

The stack should contain:

Notebook

Pen

The output should be : The count of elements in the stack is 2.   [CBSE SQP 2022]

```
stackItem = []
SItem = {'Pen': 106, 'Pencil': 59, 'Notebook': 80, 'Eraser':25}
def Push(SItem):
    count = 0
    for k in SItem:
        if (SItem[k] >= 75):
            stackItem.append(k)
            count = count + 1
    print("The Count of elements in the stack is ", count)

Push(SItem)
```

Assignment

1. Sanya wants to remove an element from empty stack. Which of the following term is related to this?

   (a) Empty Stack   (b) Overflow   (c) Underflow   (d) Clear Stack

2. In Stack, all operations takes place at_____.
   1. Top
   2. Front
   3. Rear
   4. Any

3. Insertion and Deletion operations of Stack are known as _____ respectively.
   A. Insertion and Deletion
   B. Push and Pop
   C. Pop and Push
   D. Enqueue and Dequeue

4. When a Stack is empty, the TOP will reset to:
   - NONE
   - 1
   - -1
   - None of the above.

5. Which of the following is not an inherent application of Stack?
   - Reversing a String.
   - Evaluation of postfix expression.
   - Implementation of recursion.
   - Job Scheduling.

6. Data structures are:
   - Network structures.
   - Group of data
   - Different types of data
   - Different operations on data

ASSERTION & REASON:
(A): Both A and R are true and R is the correct explanation for A.
(B): Both A and R are true and R is not correct explanation for A.
(C): A is true but R is false.
(D): A is false but R is true.

   - **ASSERTION (A):** Using append(), many elements can be added at a time.
     REASON(R): For adding more than one element, extend() method can be used.

- **ASSERTION (A):** A data structure is a named group of data types.
  REASON(R): A data structure has a well-defined operations, behaviour and properties.

- **ASSERTION (A):** LIFO is a technique to access data from queues.
  REASON(R): LIFO stands for Last In First Out.

- **ASSERTION (A):** A Stack is a Linear Data Structure, that stores the elements in FIFO order.
  REASON(R): New element is added at one end and element is removed from that end only.

- **ASSERTION (A):** An error occurs when one tries to delete an element from an empty stack.
  REASON(R): This situation is called an Inspection.

- **ASSERTION (A):** A stack is a LIFO structure.

  REASON (R): Any new element pushed into the stack always gets positioned at the index after the last existing element in the stack.

8   Write a function in Python POPSTACK (L) where L is a stack implemented by a list of numbers. The function returns the value deleted from the stack.

9   A list contains following record of a customer:
       [Customer_name, Phone_number, City]
       Write the following user defined functions to perform given operations on the stack named 'status':
      (i) Push_element() - To Push an object containing name and Phone number of customers who live in Goa to the stack
      (ii) Pop_element() - To Pop the objects from the stack and display them. Also, display "Stack Empty" when there are no elements in the stack.
      For example: If the lists of customer details are:
      ["Gurdas", "99999999999","Goa"]
      ["Julee", "8888888888","Mumbai"]
      ["Murugan","77777777777","Cochin"]
       ["Ashmit", "1010101010","Goa"]
      he stack should contain
      ["Ashmit","1010101010"]
      ["Gurdas","9999999999"]
      The output should be:
      ["Ashmit","1010101010"]
      ["Gurdas","9999999999"] Stack Empty

10   Write a function in Python, Push(SItem) where , SItem is a dictionary containing the details of stationery items– {Sname:price}.
The function should push the names of those items in the stack who have price greater than 75.
Also display the count of elements pushed into the stack.
 For   example: If   the   dictionary   contains   the   following   data:
Ditem={"Pen":106,"Pencil":59,"Notebook":80,"Eraser":25}
 The stack should contain:
 Notebook
 Pen
 The output should be:

11   Create a stack that stores dictionaries as elements. Each dictionary represents a person's information
(name, age, city).
   - Implement a `push_dict` method to push a dictionary onto the stack of person above age 20
   - Implement a `pop_dict` method to pop the top dictionary from the stack.

12   - Create a stack to manage student records. Each student record is represented as a dictionary containing attributes like student ID, name, and GPA.

   - Implement a `push_student` method to push student records onto the stack that GPA above 60.

   - Implement a `pop_student` method to pop the top student record from the stack.

13   Assume a nested dictionary .Each dictionary can contain other dictionaries as values.the format of the dictionary is as follows:

{1:{'a':'one,'b':'two},2:{'x':10},3:{'y':100,'z':200}....}

Create a stack that stores dictionaries as elements.

   - Implement a `push_nested_dict` method to push a values of nested dictionary onto the stack.

   - Implement a `pop_nested_dict` method to pop the top element from the stack.

for example :
after implementing push_nested_dict() , the stack becomes:

{'y':100,'z':200}

{'x':10}

{'a':'one,'b':'two}

14   Write the definition of a function POP_PUSH (LPop, LPush, N) in Python. The function should Pop out the last N elements of the list LPop and Push them into the list LPush. For example:

If the contents of the list LPop are [10, 15, 20, 30]
And value of N passed is 2, then the function should create the list LPush as [30, 20] And the list LPop should now contain [10, 15]
NOTE: If the value of N is more than the number of elements present in LPop, then display the message "Pop not possible".

15   A list contains following record of customer:

[Customer_name, Room Type]
Write the following user defined functions to perform given operations on the stack named 'Hotel':
(i) Push Cust() - To Push customers' names of those customers who are staying in 'Delux' Room Type.
(ii) Pop Cust() - To Pop the names of customers from the stack and display them. Also, display "Underflow" when there are no customers in the stack.
For example:
If the lists with customer details are as follows:
[["Siddarth", "Delux"] ["Rahul", "Standard"] ["Jerry", "Delux"]]
The stack should contain
Jerry
Siddharth
The output should be:
Jerry
Siddharth
Underflow

16   Write a function in Python, Push (Vehicle) where, Vehicle is a dictionary containing details of vehicles (Car_Name: Maker). The function should push the name of car manufactured by TATA' (including all the possible cases like Tata, TaTa, etc.) to the stack. 3
For example:
If the dictionary contains the following data: Vehicle=("Santro": "Hyundai", "Nexon": "TATA", "Safari": "Tata"}

The stack should contain

Safari
Nexon

Computer Networks

Topics to be covered

1. Evolution of networking
2. Data communications terminologies
3. Transmission Media
4. Network Devices
5. Network Topologies
6. Network Types
7. Network Protocols

What is Network?

It is a collection of Inter-connected computers and other devices that are able to communicate with each other i.e. it is a collection of hardware and software components that are connected together for effective information interchange wherein, one system/device is the sender and the other is the receiver.

Advantages of Computer Network:

a. Resource sharing
b. Remote access
c. Cost saving
d. Collaborative user interaction
e. Time saving
f. Enhanced storage

Drawbacks

a. Poor handling can cause chaos
b. If the files are stored centrally, it may sometimes become impossible to carry out any task
c. File security becomes high priority task in case of shared network
d. One may need specified staff to ensure data security

Evolution of Networking

Network Communication dates back to the earliest times since the evolution of human race on earth. All the living organisms communicate with each other on one way or the other. The early man used to communicate using the symbolic language, then with the development of modern languages and intelligence, the communication media came into picture. And, with the advent of computer systems, the data communication became important so as to take necessary decisions and pass the messages quickly.

In year 1967, the very first network came into existence, namely-ARPANET.

ARPANET

(Advanced Research Project Agency Network) that was designed to survive any nuclear threat. It was the first system to implement the TCP/IP protocol suite and was based on Client-Server architecture.

NSFNet

National Science Foundation Network, was started in 1980 with a view to enhance Academic and Scientific Research. It connected its server with the ARPANET in year 1986.

In the year 1990, the NSFNet, ARPANET and other smaller networks clubbed together to form the INTERNET (Interconnected Networks) and hence the foundation of modern INTERNET was laid down.

Internet:

It is the global network of interconnected devices that may/may not follow same set of rules, and connect together for sharing information and establishing communication. It is made up of two parts:

a. **IntraNet:**

The word Intra means inside or within. Therefore, Intranet means the network within an organization. It is created using the protocols of LANs and PANs. Example: Wipro uses internal network for business development

b. **Extranet:**

It is the network that lies outside the limits of the IntraNet. Dell and Intel use network for business related operation.

c. **Interspace:**

It is the client-server software program that allows multiple users to communicate with each other using real-time audio, video and text in a dynamic 3D environment.
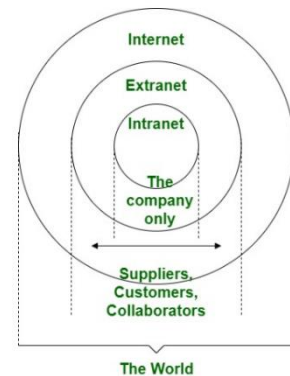
Data Communication

Data:

It is raw facts and figures that are yet to get a defined meaning. Examples: 11, A123x@r67Y, etc.

Information:

The processed form of data that had a defined meaning is known as the information. Examples: Roll No. 11, Password: A123x@r67Y, etc.

Data Channel:

It is a medium to carry information or data from one point to another.

Baud:

It is the measurement of the data transfer rate in a communication channel.

Bits per Second:

It is the rate by which the data transfer is measured. It is used to measure the speed of information through high-speed phone lines or modems. It is denoted ad **Bps, kbps, Mbps, Gbps,** etc.

Bandwidth:

It is the difference between the highest and lowest frequencies in a channel. The high bandwidth channels are known as **Broadband** Channels, and the low bandwidth channels are called as the **Narrowband** Channels.

Data Transfer Rate:

It is the amount of data transferred per second by a communication channel or a computing storage device. When applied to the data transmission rate, the abbreviations like K, M, G, T are added to the data rate that denote Kilo, Mega, Giga, and Tera respectively. They work in the power of 1024. Example 1 GB = 1024 MB, 1 TB = 1024 GB.

Switching Techniques:

These are used for transmitting data across the networks. The various switching techniques are:

a. Circuit Switching:

Here, the connection between the sender and receiver is established first, and then the data is transmitted from the source computer to destination computer. Before transferring the data, a call setup is required for establishing connection between sender and receiver. It is best for connections that require consistent bit rate for communication.

b. Message Switching:

In this technique, the message is sent to the switching office first that stores the data in the buffer, and then the switching office finds the free link to the receiver, and then sends the data to the receiver. There is no limit to the size of the message block to be transmitted over the network.

c. Packet Switching:

It is the most efficient data communication technique used to send and receive data over the internet. Instead of using the dedicated circuit for data communication, the data is independently routed through the network and reassembled at the destination computer system. Data is divided into fixed size packets before transmission. Each packet contains a fraction of data along with addressing information.

Comparison of circuit Switching, Packet switching & Message Switching

Parameter	Message switching	Circuit switching	Packet switching
Application	Telegraph network for transmission of telegrams	Telephone network for bi-directional, real time transfer of voice signals	Internet for datagram and reliable stream service between computers
End terminal	Telegraph, teletype	Telephone, modem	Computer
Information type	Morse, Baudot, ASCII	Analog voice or PCM digital voice	Binary information
Transmission system	Digital data over different transmission media	Analog and digital data over different transmission media	Digital data over different transmission media

Transmission Medias

A transmission media refers to the medium by which the data is transferred from one device to another. A transmission media can be:

a. Wired Transmission Media
b. Wireless Transmission Media

Wired Transmission Medias

In computer networks, wired transmission media refers to the physical mediums through which data is transmitted from one device to another. These media provide a pathway for electrical signals to travel, facilitating communication between network devices. Some common types of wired transmission media used in computer networks include:

A. Twisted Pair Cable:

Unshielded Twisted Pair (UTP) and Shielded Twisted Pair (STP) cables are widely used for Ethernet networking. UTP is commonly used in home and office networks due to its cost-effectiveness and ease of installation. STP provides better noise immunity and is suitable for environments with higher electromagnetic interference.
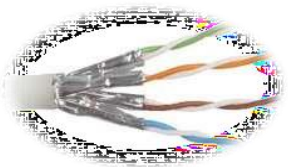
B. Coaxial Cable:

Coaxial cables consist of a copper conductor surrounded by a dielectric insulating material and a metallic shield. They are commonly used in Cable Television (CATV) networks and some older Ethernet installations.

C. Fiber Optic Cable:

Fiber optic cables use strands of glass or plastic to transmit data as pulses of light. They offer high data transfer rates, long-distance capabilities, and immunity to electromagnetic interference. Fiber optics are commonly used in high-speed data networks, telecommunications, and internet backbone connections.
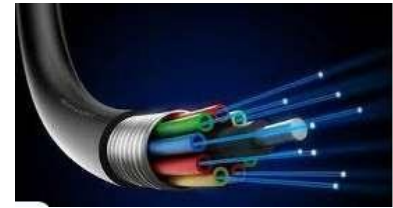
D. Ethernet Cable:

Ethernet cables, such as Cat5e, Cat6, and Cat7, are a subset of twisted pair cables specifically designed for Ethernet networking. They are used to connect devices in local area networks (LANs) and provide reliable data transmission.
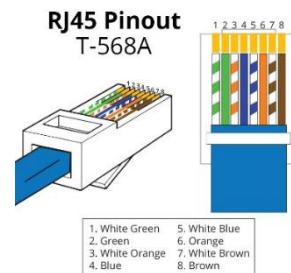
E. Power Line Communication (PLC):

PLC enables data transmission over existing electrical power lines. It is sometimes used to provide networking in situations where laying dedicated network cables is impractical.

F. Structured Cabling Systems:

Structured cabling refers to a standardized cabling infrastructure used to support various communication technologies within a building or campus. It typically involves a combination of twisted pair and fiber optic cables organized in a structured manner.

The choice of wired transmission media depends on factors such as data transfer speed requirements, distance, environmental conditions, and cost considerations. Each type of cable has its advantages and limitations, and network designers choose the most appropriate medium based on the specific needs of the network.

Wireless Transmission Medias

In computer networks, wireless transmission media refers to the means of transmitting data between devices without the use of physical cables. Wireless communication relies on electromagnetic waves to carry information. Some common types of wireless transmission media used in computer networks include:

A. Wi-Fi (Wireless Fidelity):

Wi-Fi is a widely used wireless technology for local area networking (LAN) and internet access. It operates in the unlicensed radio frequency bands, such as 2.4 GHz and 5 GHz, allowing multiple devices to connect to a wireless access point (router).

B. Bluetooth:

Bluetooth is a short-range wireless technology commonly used for connecting devices like smartphones, laptops, and peripherals (e.g., wireless keyboards, mice, and headphones). It

operates in the 2.4 GHz frequency band and supports relatively low data transfer rates compared to Wi-Fi.

C. Infrared (IR):

Infrared communication uses infrared light to transmit data between devices. It is commonly found in remote controls for TVs, audio systems, and other consumer electronics.

D. Microwaves:

These are high frequency waves that can be used to transmit data over long distances, in a straight line, but these can not penetrate through solid objects. It consists of a transmitter, receiver, and air.
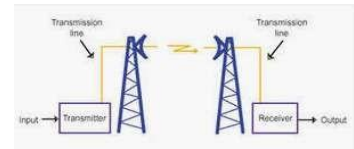
E. Radio Frequency Identification (RFID):

RFID uses radio waves to identify and track objects equipped with RFID tags. It is used in various applications, including supply chain management, access control, and asset tracking.

F. Satellite Communication:

Satellite communication involves transmitting data to and from Earth through communication satellites. It is used for long-distance communication in remote areas or where traditional wired communication is not feasible.
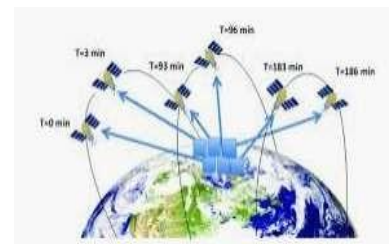
G. Near Field Communication (NFC):

NFC enables short-range communication between devices (typically within a few centimeters). It is commonly used for contactless payment systems and data exchange between smartphones.

H. Cellular Networks:

Cellular networks provide wireless communication over a large geographic area using cell towers. They are the foundation for mobile phone networks and mobile internet access.

I. Wireless Sensor Networks (WSNs):

WSNs consist of interconnected sensors that wirelessly communicate with each other to gather and transmit data from the environment. They are used in various applications, such as environmental monitoring and industrial automation.
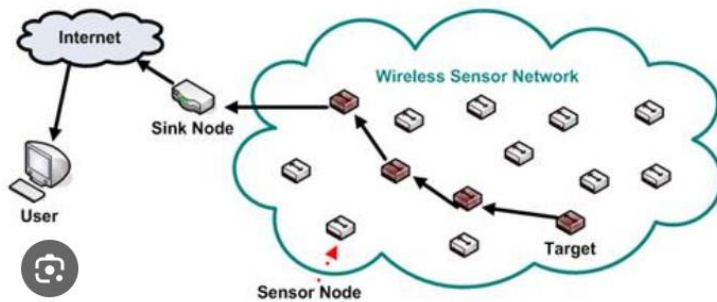
Wireless transmission media offer the advantage of mobility and flexibility, allowing devices to connect without the constraint of physical cables. However, they may be susceptible to interference, have limited range, and typically offer lower data transfer rates compared to wired media. The choice of wireless media depends on factors such as the required coverage area, data transfer speed, power consumption, and potential interference in the operating environment.

Sink Node:

It is a node with no outward connections to other nodes. In other words, it sends information to other nodes, but cannot receive the information by itself.

Network Devices:

For smooth functioning of computer network, other than computers and wirings, many devices play an important role. These devices are known as the Network Devices.

A. Modem:

Modulator-Demodulator allows us to reach the global network with ease. It is used to send and receive the data over the telephone lines or cable connections. Since, the ordinary telephone lines cannot carry the digital information, a modem changes the data from analog to digital format and vice versa.

Modems are of two types:

1. Internal modems: The modems that are fixed in the computer systems are Internal Modems.
2. External Modems: The modems that are connected externally are called External Modems.

B. Registered Jack-45 (RJ-45):

Registered Jack-45 of Rj-45 is an 8-wire connector that is commonly used on computers in a local area network. It looks similar to a standard phone connector (RJ-11), but is wider than the RJ-11 connector, as it uses 8 wires instead of 4. These are used to connect computers in Ethernet LAN.

C. NIC:

Network Interface Card (NIC) is a device used to connect the network with the Internet. It is sometimes called ad the TAP (Terminal Access Point). Since different manufacturers give different names to this device, hence, it is sometimes referred to as NIU (Network Interface Unit).

The NIC has a unique physical address to each card, and it is known as MAC (Media Access Control) Address.

D. MAC Address:

It is a b-byte address assigned to each NIC card and is separated by a colon. Example:

<u>10 : E8 : 05</u> : <u>67 : 2A : GS</u>

Manufacturer ID   Card No.

E. Ethernet Card:

It is a LAN architecture developed by *Xerox Corp* along with the DEC and Intel. It uses a bus or star topology for data transfer and can attain a speed of up to 10 Gbps. It can connect devices in both wired and wireless LAN or WAN.

F. Router:

It is responsible for forwarding data from one network to another. The main purpose of router is sorting and distribution of the data packets to their destination based on the IP address. The router uses the Logical address scheme.

G. Hub:

It is a device that connects several devices to a network and transmits the information to all the connected devices via broadcast mode.

The hubs are of two types:

➢ Active hubs: these electrically amplify the signal as it moves from one connected device to another.
➢ Passive hubs: these allow the signals to pass from one device to another without any change.

H. Switch:

It is a device that is used to divide network into smaller networks called *subnets* or LAN segments. This helps to avoid network traffic as it divides the traffic into smaller parts. It is responsible for filtering of data packets and then transmission over the network.

I. Repeaters:

A repeater is a network device that amplifies, restores and re-broadcasts signals for long-distance transmission.

J. Bridge:

It is a device that links two networks. It is smart system that knows which system lies on which side and in which network. These can handle the networks that follow different protocols.

K. Gateway:

It connects two dissimilar networks and establishes an intelligent connection between local and external networks with completely different architecture. It is also known as protocol translator.

L. Wi-Fi Card:

It is the LAN adapter whether external or internal with a built-in antenna and wireless radio. Its main benefit is that it allows a computer to setup the system as workstation without considering the availability of hard-line access.

Network Topologies

The term topology means the way of connecting different systems to form a network. Some of the commonly used topologies are as follows:

A. Bus Topology:

1. In a bus topology, all devices are connected to a single communication line called the bus or backbone.
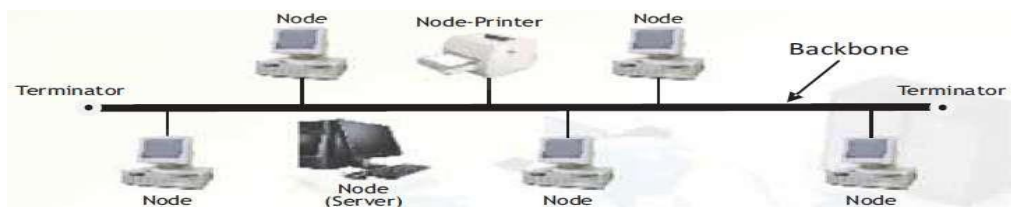
2. Data is transmitted from one end of the bus to the other, and all devices receive the data simultaneously.
3. It is relatively easy to implement and works well for small networks. However, a single break in the bus can disrupt the entire network.

B. Star Topology:

1. In a star topology, all devices are connected to a central hub or switch.
2. Each device has a dedicated point-to-point connection to the central hub.
3. If one device or cable fails, only that specific connection is affected, and the rest of the network remains operational.
4. It is straightforward to add or remove devices, making it scalable.

C. Ring Topology:

1. In a ring topology, devices are connected in a closed loop, forming a ring.
2. Each device is connected to exactly two other devices, creating a continuous circular pathway for data transmission.
3. Data travels in one direction around the ring until it reaches the intended recipient.
4. Failure of any single device or connection can disrupt the entire network.
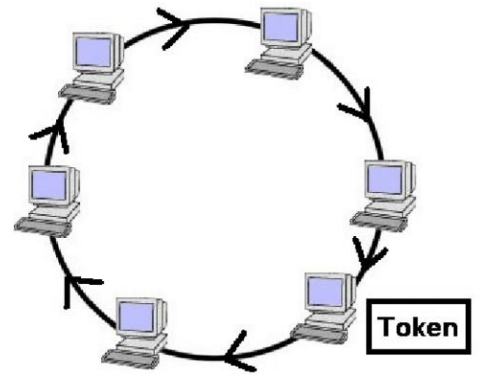
D. Mesh Topology:

1. In a mesh topology, every device is connected to every other device in the network. It provides multiple redundant paths for data transmission, ensuring high reliability and fault tolerance.
2. Mesh topologies are commonly used in critical applications where network uptime is crucial. However, the extensive cabling and complex connections can be expensive and challenging to manage.
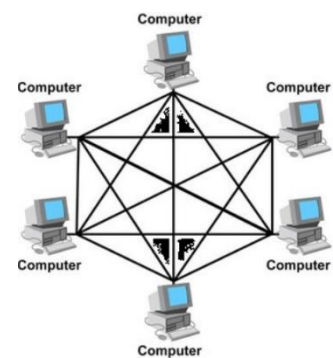
E. Hybrid Topology:

1. A hybrid topology is a combination of two or more basic topologies (e.g., star-bus or star-ring).
2. It leverages the advantages of different topologies and can be designed to suit specific networking needs.
3. Hybrid topologies are commonly used in large networks or in scenarios with diverse connectivity requirements.
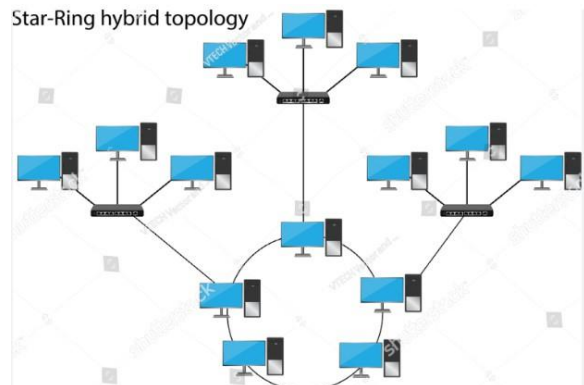
F. Tree Topology:

Tree topology is a network design where devices are organized in a hierarchical structure, resembling a tree with a root node at the top and branches of nodes extending downward.

1. The root node acts as the central hub, and devices are connected to it directly or through intermediary devices like switches or hubs.
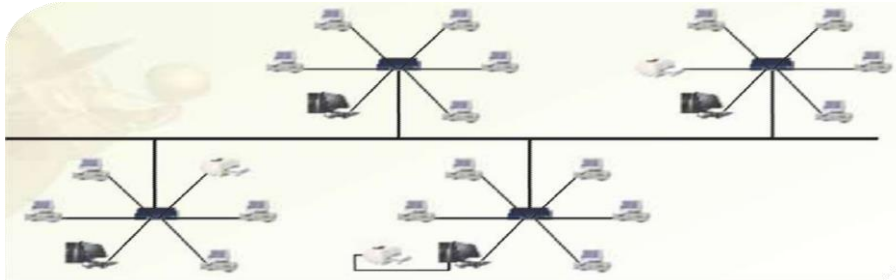
2. This creates a multi-level structure, with each level representing a different generation of devices.

Tree topology is commonly used in wide area networks (WANs) to interconnect different local area networks (LANs) or subnets in a hierarchical manner. It is also found in some enterprise networks and telecommunications networks.

Advantages of Tree Topology:
1. Scalability: The network can be easily expanded by adding more devices or branches.
2. Centralized Management: The root node allows for centralized control and easy network management.
3. Fault Isolation: Issues in one branch do not affect the rest of the network, simplifying troubleshooting.
4. Point-to-Point Connections: Devices have dedicated connections, reduced data collisions and improving performance.

Disadvantages of Tree Topology:
1. Dependency on Root Node: The network's functionality relies on the root node, and its failure can disrupt the entire network.
2. Cost: Implementing tree topology can be expensive, especially for larger networks.
3. Complex Cabling: As the network grows, the cabling can become more complex and difficult to manage.

Types of Networks:
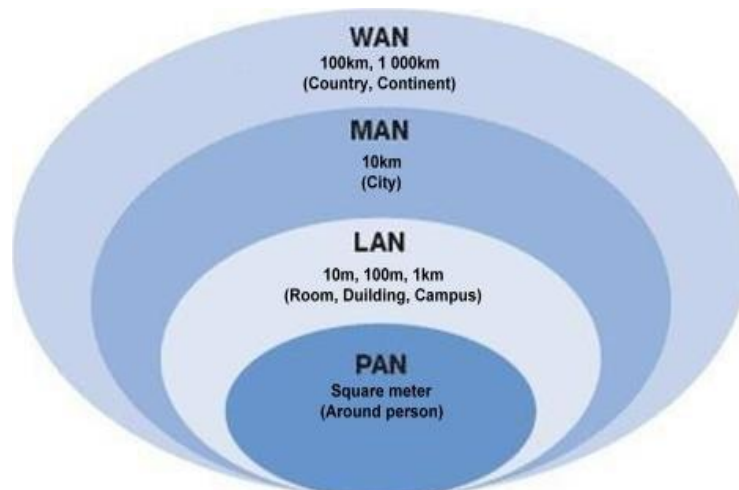
The computer networks are divided into the following parts based on the network span and number of systems connected.

1. PAN - Personal Area Network
2. LAN - Local Area Network
3. MAN - Metropolitan Area Network
4. WAN - Wide Area Network

PAN – Personal Area Network:

A personal area network (PAN) is designed for interconnection between devices typically located within the range of 10 meters approx. These are used to connect personal use devices like smartphones, laptops, tablets, wearable devices and other peripherals.

Bluetooth and Wi-Fi are the commonly used technologies for establishment of PANs.

PANs find applications in various scenarios, such as:

a. Wireless Headsets: For establishing connections between computers/smart phones with headsets/head phones.
b. Personal health Devices: For pairing fitness related trackers/ smart phones for monitoring health and workout timings.
c. Home automation: For connecting home use and safety devices to a central controller such as smart phone.

PAN: Personal Area Network

d. File Transfer: For ensuring smooth and fast transfer of files between laptops, tablets etc.
e. Security: To enhance and implement security protocols like encryption to ensure data privacy and prevent unauthorized access to the connected devices.
f. Ad-Hoc Networking: These are often used as Ad-Hoc networks for use as and when required. These networks are established and disbanded as per the requirement. Also, the devices can quickly connect to the network and disconnect whenever they are in or out of range.
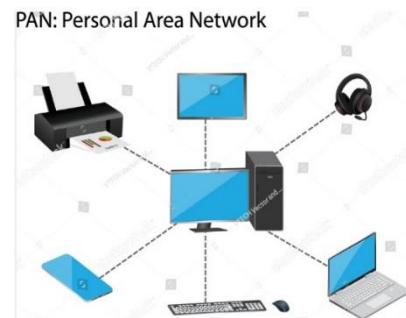
LAN – Local Area Network

A local area network (LAN) is designed for implementation between devices that are located within a limited geographical area generally within the range of approximately 1 – 10 KM. this network can be setup using wired or wireless transmission medias, and can be controlled by an individual or an organization. It is also known as Intranet as it is a network within an organization.

a. These can use various topologies such as star, bus, ring, or mesh. The most commonly used topology for LANs is the Star topology, where all the devices are connected to a central switch or hub.

b. LANs offer high data transfer rates as the network has a limited span enabling fast communication and resource sharing.

c. The network administrator can easily manage and monitor devices in a LAN.

d. The LANs are commonly used in offices, homes, and educational institutions.

e. LANs implement security measure such as Firewalls, access controls, and encryption to protect data and unauthorized access to the network at a much cheaper cost.
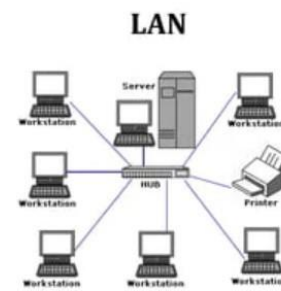
MAN – Metropolitan Area Network:

It is a network infrastructure that covers a larger geographical area than a Local Area Network (LAN) but smaller than the Wide area Network (WAN). These use various connectivity technologies including fiber-optic cables, microwave links and wireless technologies to interconnect devices and networks within the area of a city and ranges between 5 – 100 KMs.

a. MANs often use high speed technologies like fiber-optic cables, microwave links to provide fast and reliable data transmission between network nodes.

b. These are often used by government agencies and large educational institutions to interconnect LANs and share resources like files, databases, and applications.

c. They often use different Internet Service Providers (ISPs) for effective data communication thereby strengthening the backbone of the Internet.

d. These can be either privately owned, cooperative, or government owned to provide services to the public.

e. These networks have grown rapidly in the past few years as the spans of cities have increased rapidly.

f. The network security plays a crucial role in the MANs and increases the cost incurred due to wide area coverage.
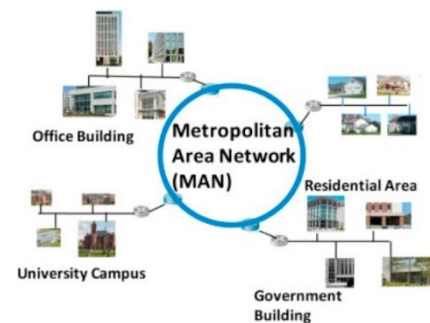
They play a significant role in interconnecting local networks within a city, enabling efficient data exchange and facilitating communication among various entities in the metropolitan region.

WAN – Wide Area Network:

It is a type of computer network that covers a vast geographical area spanning among cities, countries, or even continents.

a. These use various technologies like leased lines, fiber optic cables, and satellite links.

b. Since it is the expanded form of MAN, it is considered as the backbone.

c. These allow the efficient transfer of data, voice, and videos between different nodes thereby enabling communication and resource sharing between devices at far away distances.

d. These are designed with redundancy and backup links to ensure high fault tolerance thereby minimizing disruptions and maintaining connectivity even if some network segment fails.

e. Data Security becomes the key issue as it becomes essential to protect data from unauthorized access and cyber threats. Thus encryption, firewalls and virtual private Networks (VPNs) play an important role in ensuring data security.

f. These may have varying speeds and bandwidth depending upon the technology used and the distance between network nodes.
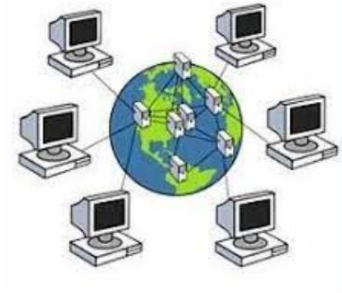
Note:

Virtual Private Network: It is used to access the public network as a private network. It ensures enhances security, and safety of data.

Difference between LAN, MAN, and WAN

Network → Parameter ↓	PAN	LAN	MAN	WAN
Area Covered	Small Area (Upto 10m radius)	A few meters to a few kilometers (Upto 10Km radius)	A city and its vicinity (Upto 100Km radius)	Entire country, continent, or globe (No upper limit)
Error Rates	Lowest	Lowest	Moderate	Highest
Transmission Speed	High Speed	High Speed	Moderate Speed	Low speed
Networking Cost	Negligible	Inexpensive	moderately expensive equipment	Expensive

Network Protocols:

These are the set of rules that are required to run the internet keeping in mind the security of data for sake of users.

1. TCP (Transmission Control Protocol):
   a. Connection-oriented protocol for reliable data transmission.
   b. Provides error checking, retransmission of lost packets, and in-order delivery.
   c. Slower than UDP due to the additional overhead for reliability.

2. UDP (User Datagram Protocol):

a. Connectionless protocol for fast, unreliable data transmission.

b. No error checking or retransmission, suitable for real-time applications.

c. Lower overhead compared to TCP.

3. IP (Internet Protocol):

a. Responsible for addressing and routing packets across networks.

b. IP version 4 (IPv4) uses 32-bit addresses (e.g., 192.168.1.1).

c. IP version 6 (IPv6) uses 128-bit addresses (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334).

4. HTTP (Hypertext Transfer Protocol):

a. Used for web page communication between a client (browser) and a web server.

b. Supports request methods like GET, POST, PUT, DELETE, etc.

5. HTTPS (Hypertext Transfer Protocol Secure):

a. Secure version of HTTP that uses encryption (TLS/SSL) to protect data during transmission.

b. Uses port 443.

6. FTP (File Transfer Protocol):

a. Used for transferring files between a client and a server.

b. Can operate in active or passive mode.

7. SMTP (Simple Mail Transfer Protocol):

a. Used for sending email messages between servers.

b. Port 25 is used for unencrypted communication, and port 587 is used for encrypted communication (SMTPS).

8. POP3 (Post Office Protocol version 3):

a. Used for retrieving email from a remote server to a local email client.

b. POP3 downloads emails to the client and removes them from the server.

9. IMAP (Internet Message Access Protocol):

a. Used for accessing email messages on a remote server from multiple clients.

b. IMAP keeps emails on the server and synchronizes changes across clients.

10. DNS (Domain Name System):

a. Translates human-readable domain names (e.g., www.example.com) into IP addresses.

b. Distributed hierarchical system for domain resolution.

11. DHCP (Dynamic Host Configuration Protocol):

1. Automatically assigns IP addresses and network configuration to devices on network.

2. Simplifies network administration by managing IP allocation.

12. ICMP (Internet Control Message Protocol):
    2.1. Used for error reporting and diagnostics in IP networks.
    2.2. Commonly associated with tools like ping to test network connectivity.

13. SLIP (Serial Line Internet Protocol):
    a. This is used for delivering/ relaying packets over the dial-up line.
    b. It defines the encapsulation mechanism for the packets.

14. PPP (Point to Point Protocol):
    a. It is the internet standard for transmission of IP packets over the serial lines.
    b. It is currently the best solution for dial-up connections.

These are just some of the many network protocols that facilitate communication and data transfer across the internet and local networks. Each one serves specific purposes and plays a crucial role in modern networking.

Web Services:

1. World Wide Web (WWW):
It is a global system of interconnected documents and resources that are accessible over the internet. It operates on the basis of hypertext links which allows the users to navigate between different documents and multimedia content.

2. Hypertext:
The web is built on the concept of hypertext where documents are linked to each other through hyperlinks. These allow the users to navigate from one place to another.

3. URL:
Each web page and the resource on the web can be accessed using the unique address called as the URL (Uniform Resource Locator).

4. Web Browser:
To access and view web pages on the internet (WWW), we need to have an application named as Web Browser. There are many web browsers available on the internet like Google Chrome, Microsoft Edge, and Mozilla Firefox etc.

5. Web Servers:
These are the computers that host websites and web applications. These respond to requests from web browsers, and provide the requested web pages and resources back to the users.

6. Weblinks:

These are the links available within the web pages that allow the users to access the pages that contain the topic related content.

7. HTML:

Hyper Text Markup Language (HTML) was developed with a view to structure and organize the static web pages. These are the symbols and codes that allow the used to develop web pages that can run over the internet. These define the layout, format, and linking of text, multimedia, and other elements within a web page. It uses tags for presentation of content.

8. XML:

Extensible Markup Language (XML) is designed to carry and store data in a structured and platform-independent format. These use the user-defined custom tags to represent specific data fields and structures. These are self-descriptive and make it easier for different applications to understand and interpret data.

9. Websites:

These are the collections of various web pages and data that are accessible for all, and are available on the internet. Many types of restrictions such as screenshot protections, copying of data can be implemented on the websites for data protection.

10. Web Hosting:

This refers to the service of providing storage space, server resources, and internet connectivity to make websites and web applications accessible to users over the internet. It allows individuals, businesses, and organizations to publish their websites on the World Wide Web, making them available to visitors and users worldwide.

a. Web hosting companies maintain powerful servers designed to store website files, databases, and other contents required for website operations.
b. These typically handle the maintenance tasks of the registered websites.
c. These ensure proper backup and recovery of the lost data (if any) while accessing it, and cope up with potential threats that can destroy data.

11. Domain Name Service (DNS):

It is a vital internet infrastructure that converts domain names into IP addresses, thereby enabling the users to navigate the web using easily recognizable and memorable names instead of numerical IP addresses.

12. Internet Protocol (IP) Address:

It is a unique serial number assigned to devices on a network, facilitating communication and data exchange between them over the internet, and other IP based networks. These are of two types:

a. IPv4:

These are the addresses that consist of 32-bit addressing scheme. Example: 192.168.0.24

b. IPv6:

This uses 128 bit addressing scheme represented by eight groups of hexadecimal digits separated by colons. Example: 2001:0db8:85a3:0f00:00a0:8a2e:0370:7334.

The potential growth of internet-connected devices led to exhaustion of available IPv4 addresses. To cope up with this problem, the IPv6 addressing scheme was introduces that provides a significantly large pool of IP addresses to accommodate the expansion of internet.

Multiple choice questions:

1) Which network topology is characterized by a central node that connects all devices on the network?
   a) Bus
   b) Star
   c) Ring
   d) Mesh

2) In a bus topology, what happens if there is a break in the main communication line?
   a) The entire network becomes inoperative
   b) Only the affected segment becomes inoperative
   c) Data packets are automatically rerouted through an alternative path
   d) The network speed decreases but remains functional

3) Which network topology provides fault tolerance and redundancy due to multiple interconnections between devices?
   a) Bus
   b) Star
   c) Ring
   d) Mesh

4) In a ring topology, what prevents data packets from endlessly circulating the loop?
   a) Bridges
   b) Routers
   c) Token passing
   d) Firewalls

5) Which network topology allows expansion of the network by simply adding more devices to the central hub?
   a) Bus
   b) Star
   c) Ring
   d) Mesh

6) What is the main disadvantage of a mesh topology?
   a) High installation cost
   b) Difficult to set up
   c) Limited scalability
   d) Susceptible to data collisions

7) Which network topology is commonly used in Ethernet networks and provides centralized management?
   a) Bus

b) Star

c) Ring

d) Mesh

8) In a star topology, what happens if the central hub fails?
   a) The entire network becomes inoperative
   b) Only the affected segment becomes inoperative
   c) Data packets are automatically rerouted through an alternative path
   d) The network speed decreases but remains functional

9) Which network topology is best suited for small networks and has a simple and cost-effective design?
   a) Bus
   b) Star
   c) Ring
   d) Mesh

10) What network topology is typically used in token ring networks to regulate data transmission?
    a) Bus
    b) Star
    c) Ring
    d) Mesh

11) Which transmission medium uses electrical signals to transmit data over short distances inside a computer or between devices in a local network?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Infrared transmission

12) Which transmission medium offers the highest data transmission speeds and is immune to electromagnetic interference?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Wireless transmission

13) In fiber-optic cables, data is transmitted through:
    a) Electric signals
    b) Infrared waves
    c) Radio waves
    d) Light pulses

14) Twisted-pair cables are commonly categorized into two types: unshielded twisted pair (UTP) and:
    a) Fiber-optic twisted pair (FOTP)
    b) Shielded twisted pair (STP)
    c) Coaxial twisted pair (CTP)
    d) Broadband twisted pair (BTP)

15) Which transmission medium is most susceptible to signal attenuation (weakening) over long distances?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Microwave transmission

16) The transmission medium that uses radio waves to carry signals is known as:
    a) Wi-Fi
    b) Bluetooth
    c) Fiber-optic cable
    d) Twisted-pair cable

17) Which transmission medium is commonly used for cable television (CATV) and internet services?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Satellite transmission

18) What type of transmission medium is suitable for underwater communications and long-distance networking?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Infrared transmission

19) Which transmission medium uses the least secure method of data transmission and is easily intercepted by unauthorized users?
    a) Coaxial cable
    b) Fiber-optic cable
    c) Twisted-pair cable
    d) Wireless transmission

20) Which transmission medium allows communication between devices using infrared light waves?
    a) Coaxial cable

b) Fiber-optic cable

c) Twisted-pair cable

d) Infrared transmission

21) Which of the following networks covers a large geographic area and is often used to connect multiple local area networks (LANs) together?
a) LAN (Local Area Network)
b) WAN (Wide Area Network)
c) MAN (Metropolitan Area Network)
d) PAN (Personal Area Network)

22) Which type of network is designed to connect devices within a limited physical area, such as a home or office?
a) WAN (Wide Area Network)
b) LAN (Local Area Network)
c) SAN (Storage Area Network)
d) WLAN (Wireless Local Area Network)

23) The network that uses radio waves to connect devices without the need for physical cables is called:
a) WLAN (Wireless Local Area Network)
b) WAN (Wide Area Network)
c) MAN (Metropolitan Area Network)
d) SAN (Storage Area Network)

24) A network that is completely contained within a single device, such as connecting a smartphone to a smartwatch, is known as:
a) LAN (Local Area Network)
b) PAN (Personal Area Network)
c) WAN (Wide Area Network)
d) WLAN (Wireless Local Area Network)

25) A network that spans across multiple buildings within a campus or a city is called:
a) LAN (Local Area Network)
b) WAN (Wide Area Network)
c) PAN (Personal Area Network)
d) MAN (Metropolitan Area Network)

26) What type of network is the internet?
a) LAN (Local Area Network)
b) WAN (Wide Area Network)
c) SAN (Storage Area Network)
d) MAN (Metropolitan Area Network)

27) Which type of network is the most suitable for securely sharing information between two geographically distant offices of the same organization?
   a) LAN (Local Area Network)
   b) WAN (Wide Area Network)
   c) SAN (Storage Area Network)
   d) WLAN (Wireless Local Area Network)

28) What type of network is commonly used to connect devices like printers, scanners, and computer peripherals?
   a) LAN (Local Area Network)
   b) PAN (Personal Area Network)
   c) WLAN (Wireless Local Area Network)
   d) MAN (Metropolitan Area Network)

Short Answer Questions

1. What is a network topology?
2. What is the star network topology?
3. Explain Bus topology?
4. What is point-to-point network?
5. What is the most commonly used network topology in modern Ethernet LANs?
6. What advantage does the mesh topology offer in terms of reliability?
7. Which topology is commonly used in wireless networks?
8. What advantage does the bi-directional ring offer over the uni-directional ring?
9. What advantage does the tree topology have over bus topology?
10. Explain the hybrid topology in brief.
11. What are transmission medias?
12. Name the different types of transmission medias.
13. What are the advantages and drawbacks of twisted pair cables?
14. What are the main drawbacks of coaxial cables?
15. What advantage does fiber optic cables have over coaxial cables?
16. Name some examples of devices that use infrared signals?
17. In terms of data security, which type of transmission medias offer more security- guided or unguided. Why?
18. Which transmission media is commonly used to transmit data over short distances?
19. Which transmission media is commonly used to transmit data over long distances?
20. What are the main factors that influence the choice of transmission medias in a network?
21. What is a Local Area Network (LAN)?
22. What is a Personal Area Network (PAN)?
23. What is a Metropolitan Area Network (MAN)?
24. What is a Wide Area Network (WAN)?
25. What is Virtual Private Network (VPN)?
26. What is domain name service?
27. What do you understand by Web Hosting?

28. Differentiate between website, web link, and web server.
29. Differentiate between hypertext, and hyperlink.
30. What are the different internet protocols?
31. Differentiate between SMTP, POP, and FTP.
32. Define WWW.
33. Define XML.
34. Define HTML.

Long Answer Questions

1. Differentiate between the Circuit switching, and Packet Switching techniques with examples.
2. Explain the Wired Transmission medias with the help of suitable examples and diagrams.
   OR
   Explain the guided transmission medias with the help of suitable examples.
3. Explain the unguided transmission medias with the help of suitable examples.
   OR
   Explain the various wireless transmission medias with the help of suitable diagrams.
4. What do you understand by network topologies. Explain in brief, the various topologies available for establishing a successful network.
5. What are the ways by which a network can be setup in a building. Give reasons to support your answer.
6. Differentiate between LAN, MAN, and WAN giving suitable examples.
7. Based on the geographical span, what are the various topologies used for establishing communications? Explain giving suitable examples and diagrams.
8. Explain the concept of bus topology. How is it different from bi-directional ring topology.
9. Discuss the tree topology in detail. What are its applications and potential limitations.
10. Discuss the advantages and drawbacks of guided transmission medias.
11. What are the advantages and drawbacks of unguided transmission medias.

Case Study based questions

A. Web server is a special computer system running on HTTP through web pages. The web page is a medium to carry data from one computer system to another. The working of the webserver starts from the client or user. The client sends their request through the web browser to the webserver. Web server takes this request, processes it and then sends back processed data to the client. The server gathers all of our web page information and sends it to the user, which we see on our computer system in the form of a web page. When the client sends a request for processing to the web server, a domain name and IP address are important to the webserver. The domain name and IP address are used to identify the user on a large network.

1. Web servers are:
   a) IP addresses
   b) Computer systems

    c) Webpages of a site
    d) A medium to carry data from one computer to another

2. What does the web server need to send back information to the user?
    a) Home address
    b) Domain name
    c) IP address
    d) Both b and c

3. What is the full form of HTTP?
    a) Hypertext Transfer Protocol
    b) Hypertext Transfer Procedure
    c) Hyperlink Transfer Protocol
    d) Hyperlink Transfer Procedure

4. The _____ translates internet domain and host names to IP address
    a) Domain name system
    b) Routing information protocol
    c) Google
    d) Network time protocol

5. Computer that requests the resources or data from other computer is called as _____ computer
    a) Server
    b) Client
    c) None of the above
    d) a and b

6. DNS stands for:
    a) Domain Name Security
    b) Domain Number System
    c) Document Name System
    d) Domain Name System

7. What is the format of IP address?
    a) 34 bit
    b) 32 bit
    c) 16 bit
    d) 64 bit

B. In mid 80's another federal agency, the NSF created a new high capacity network called NSFnet, which was more capable than ARPANET. The only drawback of NSFnet was that it allowed only academic research on its network and not any kind of private business on it. Now, several private organizations and people started working to build their own networks, named private networks, which were later (in 1990's) connected with ARPANET and NSFnet to form the Internet. The Internet really became popular in 1990's after the development of World Wide Web.

1. What does NSFnet stand for?
   a) National Senior Foundation Network
   b) National Science Framework Network
   c) National Science Foundation Network
   d) National Science Formation Network

2. What does ARPANET stand for?
   a) Advanced Research Premium Agency NETwork
   b) Advanced Research Projects Agency NETwork
   c) Advanced Review Projects Agency NETwork
   d) Advanced Research Protection Agency NETwork

3. What is internet?
   a) A single network
   b) A vast collection of different networks
   c) Interconnection of local area networks
   d) Interconnection of wide area networks

4. To join the internet, the computer has to be connected to a _____
   a) Internet architecture board
   b) Internet society
   c) Internet service provider
   d) Different computer

5. Internet access by transmitting digital data over the wires of a local telephone network is provided by:
   a) Leased line
   b) Digital subscriber line
   c) Digital signal line
   d) Digital leased line

6. A piece of icon or image on a web page associated with another webpage is called _____
   a) URL
   b) Hyperlink
   c) Plugin
   d) Extension

C. TCP/IP, or the Transmission Control Protocol/Internet Protocol, is a suite of communication protocols used to interconnect network devices on the internet. TCP/IP can also be used as a communications protocol in a private computer network (an intranet or an extranet). TCP defines how applications can create channels of communication across a network. It also manages how a message is assembled into smaller packets before they are then transmitted over the internet and reassembled in the right order at the destination address. IP defines how to address and route each packet to make sure it reaches the right destination. Each gateway computer on the network checks this IP address to determine where to forward the message. TCP/IP

uses the client-server model of communication in which a user or machine (a client) is provided a service (like sending a web page) by another computer (a server) in the network. Collectively, the TCP/IP suite of protocols is classified as stateless, which means each client request is considered new because it is unrelated to previous requests. Being stateless frees up network paths so they can be used continuously.

1. Which of the following protocols is used in the internet?
   a) HTTP
   b) DHCP
   c) DNS
   d) All of the above

2. Which one of the following is not an application layer protocol used in internet?
   a) Remote procedure call
   b) Internet relay chat
   c) Resource reservation protocol
   d) Local procedure call

3. Which protocol assigns IP address to the client connected to the internet?
   a) DHCP
   b) IP
   c) RPC
   d) RSVP

4. Several protocols for upper layers in Bluetooth use:
   a) UDP
   b) HSP
   c) ITC
   d) L2CAP

5. Internet protocols are a set of rules to govern:
   a) communication between computers on a network
   b) standard
   c) metropolitan communication
   d) bandwidth

6. Checksum is used on internet by several protocols although not at the _____
   a) sesson layer
   b) transport layer
   c) network layer
   d) data link layer

7. Network layer at source is responsible for creating a packet from data coming from another _____
   a) station
   b) link
   c) node
   d) protocol

D. A blog is a publication of personal views, thoughts, and experience on web links. It is a kind of personal diary note about an individual. The contents published on a blog are organized in a reverse manner, it means recent posts appear first and the older posts are further downwards. Blogger – a person who posts a blog in the form of text, audio, video, weblinks, etc is known as a blogger. Bloggers have followers who follow them to get instant messages post by the blogger. In most cases, celebrities, business tycoons, famous politicians, social workers, speakers, etc are the successful blogger because people follow them to know about their success stories and ideas.

1. Using websites for building network with friends and relatives is called as_____
   a. social networking
   b. blogging
   c. netbanking
   d. e-commerce

2. Websites used to buy and sell something are categorized under_____
   a. social networking sites
   b. e-commerce websites
   c. search engines
   d. entertainment sites

3. Google is an example of _____
   a. social network
   b. entertainment
   c. search engine
   d. none of these

4. Which of the following is an example of micro-blogging?
   a. orkut
   b. facebook
   c. google +
   d. twitter

5. Which of the following is not used as blogging platform?
   a. TypePad
   b. Blogger
   c. WordPress
   d. Pinterest

6. _____ was one of the first uses of the Internet and is still the most popular use, accounting for most of the traffic on the Internet.
   a. blogs
   b. chat rooms
   c. E-mail
   d. discussion boards

E. An email is a service of sending or receiving emails or messages in the form of text, audio, video, etc over the internet. Various service providers are providing email services to users. The most popular service providers in India are Gmail, Yahoo, Hotmail, Rediff, etc. An email address for an email account is a unique ID. This email ID is used to send and receive mails over the Internet. Each email address has two primary components: username and domain name. The username comes first, followed by the @) symbol and then the domain name.

1. Unsolicited e-mail advertising is known as _____
   a. newsgroup
   b. junk ads
   c. spam
   d. none of the above

2. Which of the following is the correct format of email address?
   a. name@website@info
   b. name@website.info
   c. www.nameofwebsite.com
   d. name.website.com

3. MIME stands for
   a. multipurpose internet mail extensions
   b. multipurpose internet mail email
   c. multipurpose internet mail end
   d. multipurpose internet mail extra

4. Mail access starts with client when user needs to download e-mail from the_____
   a. mail box
   b. mail server
   c. IP server
   d. Internet

5. When sender and receiver of an email are on same system, we need only two_____
   a. IP
   b. domain
   c. servers
   d. user agents

6. NVT stands for
   a. network virtual transmission
   b. network virtual test
   c. network virtual terminal
   d. network virtual tell

F. In 1989, Tim Berners Lee, a researcher, proposed the idea of World Wide Web). Tim Berners Lee and his team are credited with inventing Hyper Text Transfer Protocol (HTTP), HTML and the technology for a web server and a web browser. Using

hyperlinks embedded in hypertext the web developers were able to connect web pages. They could design attractive webpages containing text, sound and graphics. This change witnessed a massive expansion of the Internet in the 1990s.

1. What is a web browser?
   a. A program that can display a webpage
   b. A program used to view HTML documents
   c. It enables a user to access the resources of internet
   d. All of the above

2. Dynamic web page _____
   a. is same every time whenever it displays
   b. generates on demand by a program or a request from browser
   c. both is same every time whenever it displays and generates on demand by a program or a request from browser
   d. is different always in a predefined order

3. URL stands for _____
   a. unique reference label
   b. uniform reference label
   c. uniform resource locator
   d. unique resource locator

4. AJAX stands for
   a. asynchronous javascript and xml
   b. advanced JSP and xml
   c. asynchronous JSP and xml
   d. advanced javascript and xml

5. What is DOM?
   a. convention for representing and interacting with objects in html documents
   b. application programming interface
   c. hierarchy of objects in ASP.NET
   d. scripting language

6. An alternative to JavaScript on windows platform is _____
   a. a) VBScript
   b. b) ASP.NET
   c. c) JSP
   d. d) PHP

7. A web cookie is a small piece of data that is _____
   a. a) sent from a website and stored in user's web browser while a user is browsing a website
   b. b) sent from user and stored in the server while a user is browsing a website
   c. c) sent from root server to all servers
   d. d) sent from the root server to other root servers

G. E-business, commonly known as electronic or online business is a business where an online transaction takes place. In this transaction process, the buyer and the seller do not engage personally, but the sale happens through the internet. In 1996, Intel's marketing and internet team coined the term "E-business. E-Commerce stands for electronic commerce and is a process through which an individual can buy, sell, deal, order and pay for the products and services over the internet. In this kind of transaction, the seller does not have to face the buyer to communicate. Few examples of e-commerce are online shopping, online ticket booking, online banking, social networking, etc.

1. Which of the following describes e-commerce?
    a. doing business
    b. sale of goods
    c. doing business electronically
    d. all of the above

2. Which of the following is not a major type of e-commerce?
    a. C2B
    b. B2C
    c. B2B
    d. C2C

3. Which of the following is not considered to be one of the three phrases of e-commerce?
    a. innovation
    b. consolidation
    c. preservation
    d. reinvention

4. Which segment do eBay and Amazon belong to?
    a. B2B
    b. B2C
    c. C2B
    d. C2C

5. The primary source of financing during the early years of e-commerce was _____
    a. bank loans
    b. large retail films
    c. venture capital funds
    d. initial public offerings

6. The best products to sell in B2C e-commerce are:
    a. small products
    b. digital products
    c. specialty products
    d. fresh products

7. Which of the following is not a key element of a business model?

a. value proposition
b. competitive advantage
c. market strategy
d. universal standards

H. Due to the rapid rise of the internet and digitization, Governments all over the world are initiating steps to involve IT in all governmental processes. This is the concept of e-government. This is to ensure that the Govt. administration becomes a swifter and more transparent process. It also helps saves huge costs. E-Group is a feature provided by many social network services which helps you create, post, comment to and read from their "own interest" and "niche-specific forums", often over a virtual network. "Groups" create a smaller network within a larger network and the users of the social network services can create, join, leave and report groups accordingly. "Groups" are maintained by "owners, moderators, or managers", who can edit posts to "discussion threads" and "regulate member behavior" within the group.

1. E-Government:
   a. can be defined as the "application of e-commerce technologies to government and public services ."
   b. is the same as internet governance
   c. can be defined as "increasing the participation in internet use by socially excluded groups"
   d. none of the above

2. Privacy law is intended to protect the personal information about:
   a. Individuals in society
   b. computer networks
   c. Employees
   d. Students

3. What does TAN stand for?
   a. Tax Deduction Account Number
   b. Tax Deduction and Collection Account Number
   c. Taxable Account Number
   d. Tax Account Number

4. An e-group is a collection of users _____
   a. who conduct seminars
   b. who get together on weekends
   c. who have regular video conferences
   d. having the ability to access and contribute to forum topics

5. Whenever a new comment is posted, users of the e-group receive _____ notification that there is a new contribution to the discussion.
   a. SMS
   b. E-mail
   c. WhatsApp
   d. Call

6. Which of the following has E-groups?
   a. Instagram
   b. Twitter
   c. Yahoo!
   d. WhatsApp

I. Coursera has partnered with museums, universities, and other institutions to offer students free classes on an astounding variety of topics. Students can browse the list of available topics or simply answer the question "What would you like to learn about?", then when they answer that question, they are led to a list of available courses on that topic. Students who are nervous about getting in over their heads can relax.

1. What do MOOCs stand for?
   a. Mobile Online Open Courses
   b. Massive Online Open Courses
   c. Mobile Open Online Courses
   d. Massive Open Online Courses

2. "A combination of both face-to-face, traditional classroom methods with e-learning to create a hybrid approach to teaching". What is this type of e-learning?
   a. Blended learning
   b. Distance learning
   c. Synchronous learning
   d. Asynchronous learning

3. What type involves allowing participants to complete training in their own time via web-based training i.e. email, blackboard, intranets, and where there is no help from instructors and participants can use internet as a support tool?
   a. Blended learning
   b. Asynchronous learning
   c. Distance learning
   d. Synchronous learning

4. Which of the following training scenarios would e-learning be most suitable and efficient for?
   a. Induction to the company for new employees
   b. Microsoft excel training
   c. Team-building exercise
   d. Building your assertiveness skills at work

5. What best describes a virtual classroom?
   a. Learners using technology in a classroom environment lead by a tutor
   b. Training course done by youtube tutorials
   c. An online learning environment accessed through the internet (i.e. webinars)
   d. An online learning course

6. Which of the following is not an e-learning website?

a. edX
b. MasterClass
c. Flipkart
d. SimplyCoding

J. Search Engines allow us to filter the tons of information available on the internet and get the most accurate results. And while most people don't pay too much attention to search engines, they immensely contribute to the accuracy of results and the experience you enjoy while scouring through the internet. Besides being the most popular search engine covering over 90% of the worldwide market, Google boasts outstanding features that make it the best search engine in the market. It boasts cutting-edge algorithms, easy-to-use interface, and personalized user experience. The platform is renowned for continually updating its search engine results and features to give users the best experience.

1. Search engines are:
   a. Software systems that are designed to search for information on the world wide web
   b. Used to search documents
   c. Used to search videos
   d. All of the above

2. We get a list of sites after typing a word in search bar called:
   a. Single word
   b. Key phrase
   c. Site
   d. All of the above

3. The search results are shown in a line of results. This is called:
   a. Search engine pages
   b. Categories
   c. Search engine result pages
   d. Tag list

4. Search engines are able to search _____ type of information.
   a. Videos
   b. Images
   c. Documents
   d. All of the above

5. Web search engines store information about web pages with the help of:
   a. Web router
   b. Web crawler
   c. Web indexer
   d. Web organizer

6. Web crawler is also called as:
   a. Web spider

b. Web manager
    c. Ink directory
    d. Search optimizer

7. SEO is the process of _____ of a website or a web page in a search engine's search results.
    a. Generating cached files
    b. Affecting the visibility
    c. Getting meta tags
    d. All of these

K. Ayurveda Training Educational Institute is setting up its centre in Hyderabad with four specialised departments for Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these departments and administrative office are given as follows. You, as a network expert, have to answer the queries as raised by them in (i) to (iv). Shortest distances between various locations in meters:

Administrative Office to Orthopedics Unit	55
Neurology Unit to Administrative Office	30
Orthopedics Unit to Neurology Unit	70
Pediatrics Unit to Neurology Unit	50
Pediatrics Unit to Administrative Office	40
Pediatrics Unit to Orthopedics Unit	110

Number of Computers installed at various locations are as follows :

Pediatrics Unit	40
Administrative Office	140
Neurology	50
Orthopedics Unit	80
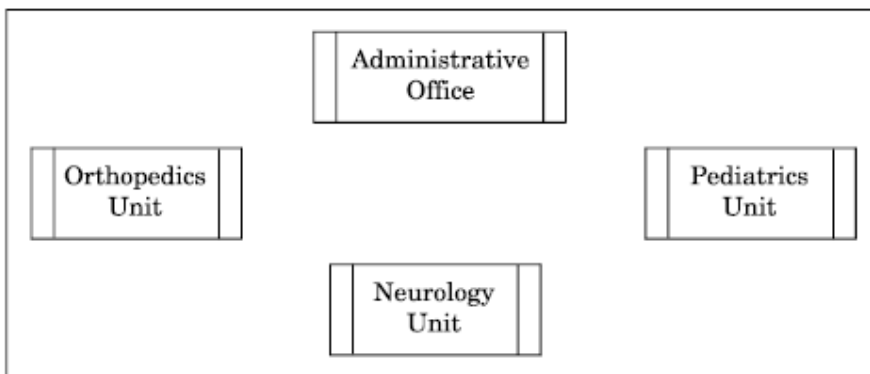
I.   Suggest the most suitable location to install the main server of this institution to get efficient connectivity.
II.   Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings.

III. Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following:
  • Gateway • Modem • Switch

IV. Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following:

Topologies: Bus Topology, Star Topology

Network Cable: Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable

L. M/S Adco Informatics Services is an educational service organization. It is planning to setup its India campus in Chennai with its head office at Hyderabad. The Chennai campus has 4 buildings- ADMIN, MEDIA, ENGINEERING, and BUSINESS.
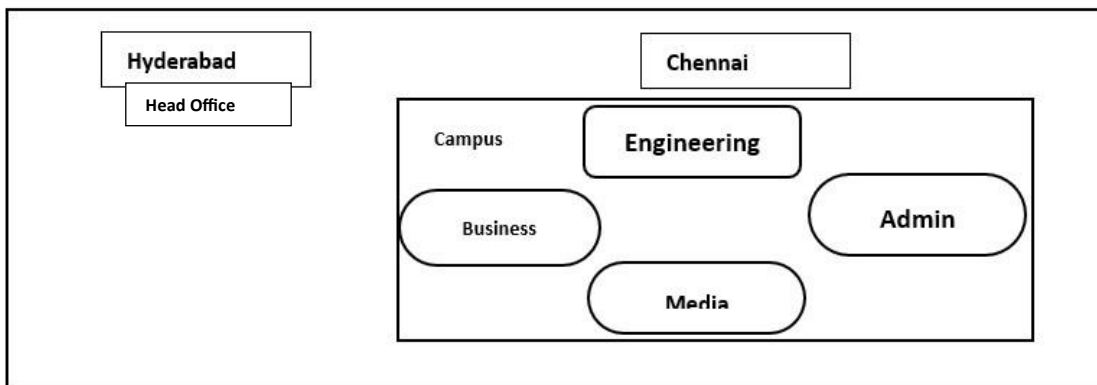
Block to block distances (in Meters)

From	To	Distance
Admin	Engineering	45 m
Admin	Business	80 m
Engineering	Business	25 m
Admin	Media	60 m
Engineering	Media	60 m
Business	Media	75 m
Hyderabad Head Office	Chennai Campus	692 Km

Number of Computers in each of the blocks/Centre is as follows:

Admin	140
Engineering	70
Business	35
Media	20
Hyderabad	30

i. Suggest and draw the cable layout to efficiently connect various blocks of buildings within the Chennai campus for connecting the devices.

ii. Which network device will be used to connect computers in each block to form a local area network?

iii. Which block, in Chennai Campus should be made the server? Justify.

iv. Which fast and effective wireless transmission medium should preferably be used to connect the head office at Hyderabad with the campus in Chennai?

v.   Is there a requirement of a repeater in the given cable layout? Why/Why not?

M. Rohit Communications International (RCI) is an online corporate training provider company for IT related courses. The company is setting up their new campus in Bengaluru. You as a network expert have to study the physical locations of various blocks and the number of computers to be installed. In the planning phase, provide the best possible answers for the queries (i) to (v) raised by them.

Physical Location of the building of RCI
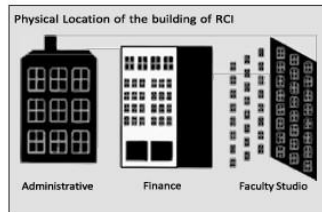
Block to block distances (in Mtrs.)

From	To	Distance
Administrative Building	Finance Building	60
Administrative Building	Faculty Studio Building	120
Finance Building	Faculty Studio Building	70

Expected computers to be installed in each block

Buildings	Computers
Administrative Building	20
Finance Building	40
Faculty Studio Building	120

i.   Suggest the most appropriate block, where RCI should plan to install the server.
ii.   Suggest the most appropriate block to block cable layout to connect all three blocks for   efficient communication.
iii. Which type of a network out of the following is formed by connecting the computers of these three blocks? (LAN, MAN, WAN, PAN)
iv.   Which wireless channel out of the following should be opted by RCI to connect to students from all over the world? (Infrared, Microwave, Satellite)
v.   What is the satellite connection?

N. Ayurveda Training Educational Institute is setting up its centre in Hyderabad with four specialised departments for Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these departments and administrative office are given as follows. You, as a network expert, have to answer the queries as raised by them.
Shortest distances between various locations in metres :

Administrative Office to Orthopedics Unit	76
Neurology unit to Administrative Office	25
Orthopedics Unit to Neurology Unit	50
Pediatrics Unit to Neurology Unit	40
Pediatrics Unit to Administrative Office	65

| Pediatrics Unit to Orthopedics Unit | 150 |

Number of Computers installed at various locations are as follows:

Pediatrics Unit	45
Administrative Office	190
Neurology	60
Orthopedics Unit	85

i. Suggest the most suitable location to install the main server of this institution to get efficient connectivity.

ii. Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings.

iii. Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following:
(1) Gateway (2) Modem (3) Switch

iv. Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following:
Topologies: Bus Topology, Star Topology
Network Cable: Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable.

O. Sanskar University of Uttarakhand is setting up a secured network for its campus at Nainital for operating day to day office and web-based activities. They are planning to have network connectivity between four buildings. Answer the questions after going through the building positions in the campus and other details given below:

The distance between various buildings of university are given as follows:
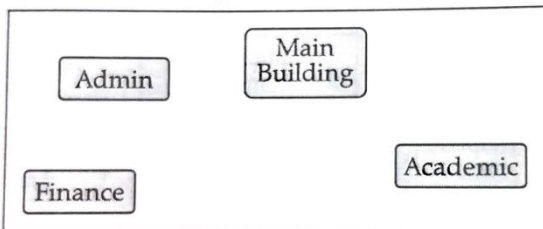
Building 1	Building 2	Distance (in mtrs.)
Main	Admin	50
Main	Finance	100
Main	Academics	70
Admin	Finance	50
Finance	Academics	70
Admin	Academics	40

Number of Computers:

Building	No. of Computers
Main	200
Admin	100
Finance	75
Academics	70

As an expert, you are required to give the best possible solutions for the given queries of the university administration:

a. Suggest the cable layout for the connection between the various buildings.
b. Suggest the most suitable building to house the server of the network of the university.
c. Suggest the placement of the following devices with justification:
   Switch/Hub
   Repeater
d. Suggest the technology out of the following for setting-up very fast internet connectivity among buildings of the university
   Optical Fibre
   Coaxial Cable
   Ethernet Cable

P. A school library is connecting computers in its units in a LAN. The library has 3 units as shown in the diagram below:
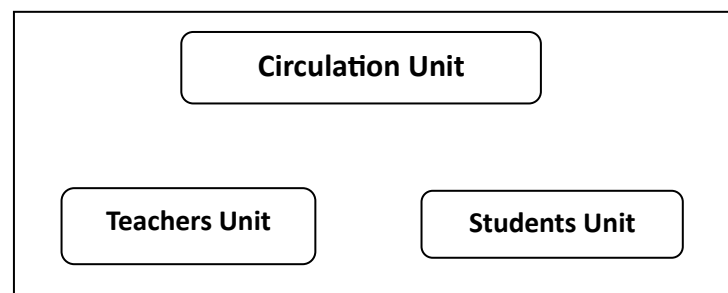
The three units are providing the following services:
1. Teachers Unit: For the access of the Library Books by teachers
2. Students Unit: For access of the Library Books by students
3. Circulation Unit: For issue and return of the books for teachers and students
   Centre to Centre distances between the 3 units are as follows:
   - Circulation Unit to Teachers Unit – 30 metres
   - Circulation Unit to Students Unit – 25 metres
   - Teachers Unit to Students Unit – 15 metres
   Number of computers in each of the units is as follows:
   - Circulation Unit 20
   - Teachers Unit 15
   - Students Unit 15

a. Suggest the most suitable place to install the server of this library with a suitable reason.
b. Suggest an ideal layout for connecting these units for a wired connectivity.
c. Which device will you suggest to be installed and where should it be placed to provide Internet connectivity to all the units.
d. Suggest the type of the most efficient and economical wired medium for connecting all the computers in the network.
e. The university is planning to connect the library with the school Principal's computer which is in his office at a distance of 50 metres. Which type of network out of LAN, MAN or WAN will be used for the network? Justify your answer.

Q. M/S Sunny Shinde and sons Training Inc. Ltd. Is a Mumbai based organization which is expanding its office in Ahmedabad? At Ahmedabad compound, they are planning to have

3 different blocks for Admin, Training, and Accounts related activities. Each block has a number of computers, which are required to be connected in a network for communication, data and resource sharing. As a network consultant, you have to suggest the best network related solutions for them for issues/problems raised by them as per the distances between various blocks/locations and other given parameters.
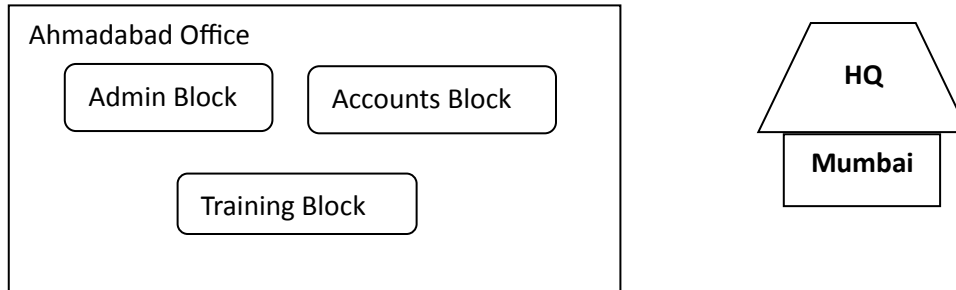
Shortest distances between various blocks/locations:

Admin Block to Accounts Block	300 metres
Admin Block to Accounts Block	200 metres
Admin Block to Accounts Block	350 metres
Mumbai Head Office to Ahmedabad Office	525 KM

a. Suggest the most appropriate block/location to house the server in Ahmedabad office to get the best and effective connectivity. Justify your answer.
b. Suggest the best wired medium and draw the cable layout to efficiently connect various blocks within the Ahmedabad office compound.
c. Suggest a device/software and its placement that would provide data security for the entire network of the Ahmedabad office.
d. Suggest a device and the protocol that shall be needed to provide wireless internet access to all smart phones/laptop users in the Ahmedabad office.

R. Knowledge Supplement Organization has set up its new centre at Mangalore for its office and web -based activities. It has 4 blocks of buildings as shown in the diagram below:
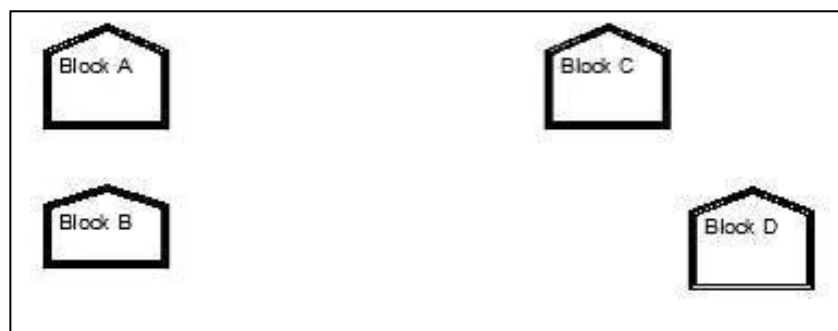
Center to center distances between various blocks:

Block A to Block B	50 m
Block B to Block C	150 m
Block C to Block D	25 m
Block A to Block D	170 m
Block B to Block D	125 m
Block A to Block C	90 m

Number of Computers

Black A	25
Block B	50
Block C	125
Block D	10

- Suggest a cable layout of connections between the blocks.
- Suggest the most suitable place (i.e. block) to house the server of organization with a suitable reason.
- Suggest the placement of the following devices with justification
  - Repeater
  - Hub/Switch
- The organization is planning to link its front office situated in the city in a hilly region where cable connection is not feasible, suggest an economic way to connect it with reasonably high speed?

S. Richard Middleton Fashion is planning to expand their network in India, starting with two cities in India to provide infrastructure for distribution of their product. The company has planned to set up their main office units in Chennai at three locations and have named their offices as "Production Unit", "Finance Unit" and "Media Unit". The company has its corporate unit in New Delhi.

A rough layout of the same is as follows:
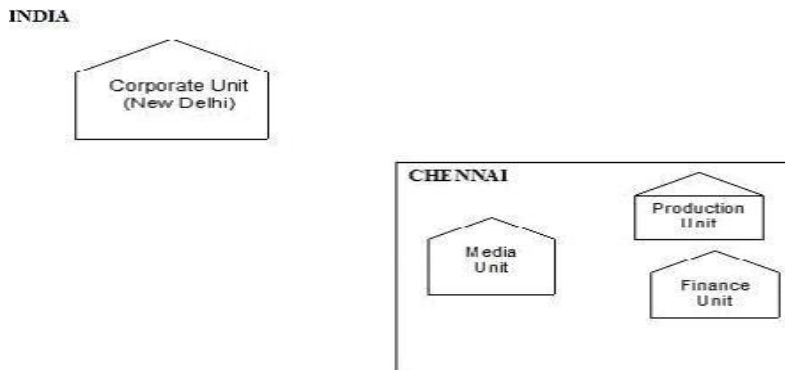
Approximate distances between these Units is as follows:

From	To	Distance
Production Unit	Finance Unit	75 Mtr
Production Unit	Media Unit	15 KM
Production Unit	Corporate Unit	2112 KM
Finance Unit	Media Unit	15 KM

In continuation of the above, the company experts have planned to install the following number of computers in each of their office units:

Production Unit	150
Finance Unit	35
Media Unit	10
Corporate Unit	30

i) Suggest the kind of network required out of (LAN, MAN, WAN) for connecting each of

the following office units:

• Production Unit and Media Unit

• Production Unit and Finance Unit

ii) Which one of the following devices will you suggest for connecting all the computers within each of their office units?

• Switch/Hub

• Modem

• Telephone

iii) Which of the following communication media, will you suggest to be procured by the company for connecting their local offices in Chennai for very effective (High Speed communication?

• Ethernet cable

• Optical fiber

• Telephone cable

iv) Suggest an effective method/technology for connecting the company's office unit located in Delhi.

T. MyPace University is setting up its academic blocks at Naya Raipur and is planning to set up a network. The University has 3 academics blocks and one Human Resource Centre as shown in the diagram below:
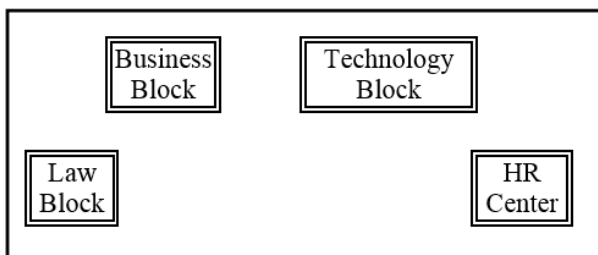
Centre to Centre distances between various blocks/centre is as follows:

Law Block to Business Block	40 m
Law Block to Technology Block	80 m
Law Block to HR Block	105 m
Business Block to Technology Block	30 m
Business Block to HR Centre	35 m
Technology Block to HR Centre	15 m

Number of computers in each of the block/Centre is as follows:

Law Block: 15

Technology Block: 40

HR Centre: 115

Business Block: 25

a.) Suggest the most suitable place (i.e., Block/Centre) to install the server of this university with a suitable reason.

b.) Suggest an ideal layout for connecting these blocks/centres for a wired connectivity.

c.) Which device will you suggest to be place/installed in each of these blocks/centres to

efficiently connect all the computers within these blocks/centres?

d.) Suggest the placement of a Repeater in the network with justification.

e.) The university is planning to connect its admission office in Delhi, which is more than 1250 Km from university. Which type of network out of LAN, MAN or WAN will be formed? Justify your answer.

Database

Management

Systems

Topics to be covered

1. Database concepts
2. Relational data model
3. Structured Query Language
4. Interface of python with an sql database

UNIT-III

DATABASE MANAGEMENT:

Database Concept:

Introduction of Database:

Database is a word which composed of two words Data and Base. Data means raw facts and figures and base is place or location where data is being stored.

Or we can say that Database is collection of **interrelated data or record** in organized form so it can easily be accessed, managed and updated. **Interrelated data** means that the data is related or connected to each other with respect to the given attributes or column.

Database uses various fields to manage and store large amounts of information in organized and structured format

DIAGRAM: 1
HOW DATABASE WORKS

Introduction of Database Management System (DBMS):

DBMS is shorten name used for Database Management System. So, as we are aware of database now, we need to understand what DBMS is. Let's understand it.

DBMS is a software system which is used to manage Database. DBMS acts as an interface between a user and database which enables the user to create, insert, retrieve, update and delete the data.

Need of Database:

Centralized Storage: Storage of data in a single location or central database.

Data Integrity: Enforces data integrity rules which ensures that information stored is accurate, valid and consistent.

Data Security: Control access to sensitive data and protecting data from unauthorized access.

Data Retrieval: Authorized User/Application can access and retrieve the information as per their need.

Efficient Data Retrieval: Database helps user to retrieve data in an efficient way.

DBMS Model:

DBMS refers to that architecture/approach for how data is stored, organized and manipulated in a database. There are several types of DBMS Model.

1. **Relational Model:**
   Data organized into tables with rows and columns.
2. **Hierarchical Model:**
   Data organized in Tree like structure with parent child relationship
3. **Network Model**:
   Similar to hierarchical model. It uses pointers to navigate through data.
4. **Object Oriented Model:**
   Data is represented as object. This model uses object oriented databases.

Now as per you CBSE syllabus we will discuss about Relational Data Model in detail.

Relational Data Model:

Relation Data Model is proposed by E.F. Codd in 1970.

In simple words, we can say that Relational data model is a model which uses **relation** to organize their **data**. Here, **Relation means table** and table is composed of **rows** and **column**s.
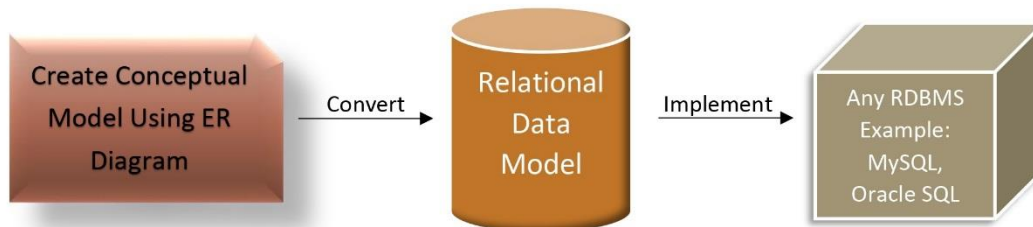
DIAGRAM: 2

ABOVE DIAGRAM SHOWS THAT HOW TO IMPLEMENT RELATIONAL DATA MODEL
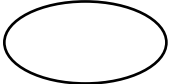
After creating conceptual data model using ER Diagram we need to convert it into Relational Data Model so that we can implement using any RDBMS language like MySQL, Oracle SQL.

Before we proceed further, let's discuss about some aspects of Conceptual Data Model

Conceptual Data Model is used to capture the meaning of data from the viewpoint of the user and try to represent it using Data Model tools like ER Diagram and Object Oriented Diagram

Basic Terminology of ER Model:

ER stands for **Entity-Relationship Model**. ER Model tools are used to represent Conceptual Data Model. Let's see some basic tools of ER Model.

Entity	Any real world object is known as entity like person, place, object and event	
Relationship	Show interconnection between two or more entity	
Attribute	Shows property/characteristics of an entity/relationship type	

Relation/Table:

Relation is also known table. And table is a collection of related data and information in row and column. Relation is composed of rows and columns.

Row/Tuple/Record:

Row represent horizontal form of Table/Relation. Row is also known as tuple/record.

Column/Attributes:

Column represent vertical form of Table/Relation. Column is also known as attributes.

Cardinality:

Total number of row/record/tuple in a relation is called as Cardinality.

Degree:

Total number of column/attributes in a relation is called as Degree.
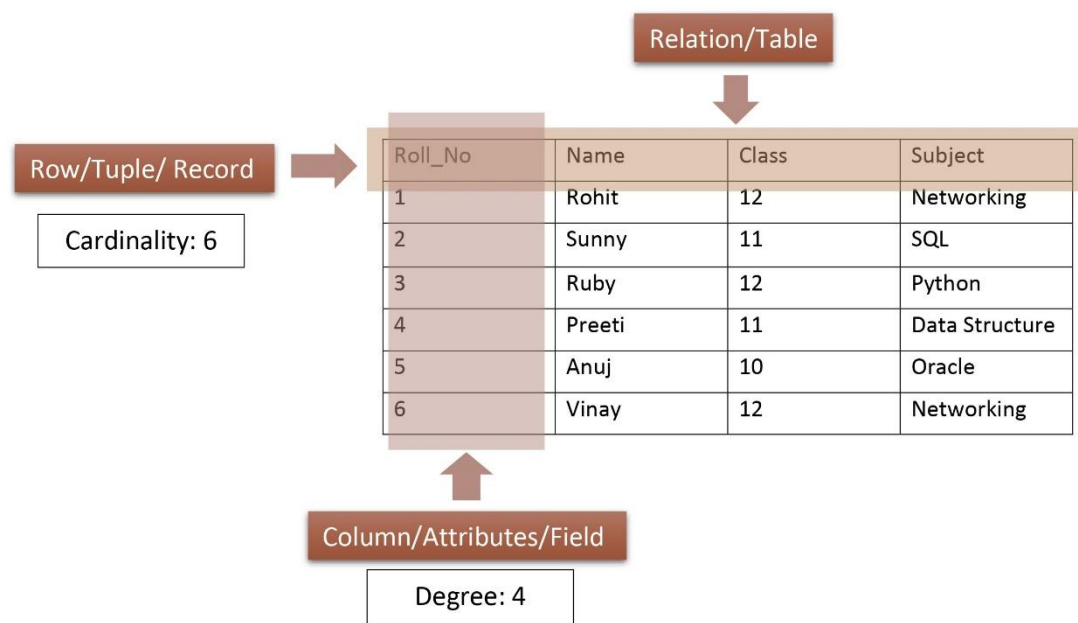
DIAGRAM: 3

RELATION/TABLE COMPOSED OF ROW/RECORD AND COLUMN/ATTRIBUTES

Domain:

Domain is **set of possible value** or **range of valid values** or **set of all unique values** that an attribute/column can hold.

A Domain of database is set of atomic value (which can't further be distributed) of a particular attribute/column.

For example:

In table Employee, Attribute/column gender may have only M, F and T Domain. Only these value valid for that column.

Domain of S.No. Contain set of all possible roll numbers.

Domain of Martial Status contain set of all possible values like Married, Widow, Unmarried and Divorce.

In the below diagram 4, Table Employee contain S.No, Name, Address, Gender and Marital status. Two domain is showing name gender and marital status which contain set of possible values that an attribute can hold. Gender can only hold three possible values and marital status can only hold four possible values
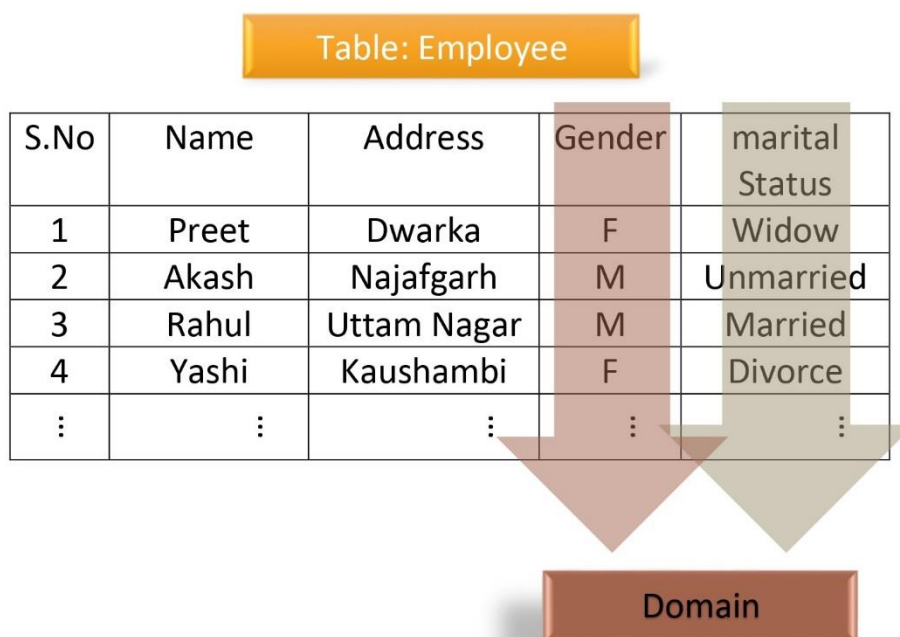
DIAGRAM: 4

DOMAIN IN A RELATION

DATATYPES IN SQL:

Before discussing commands in detail we need to learn about datatype of column/attribute:

We need to assign datatype when we are declaring any column/attributes. Every column required name and datatype. This datatypes is used to declare what type of data that will be stored in particular column. There are lots of datatypes available in SQL we will discuss some important datatype.

Commonly used datatype in SQL:

1. Numeric Type:

- INT: Integer type
- FLOAT: Floating-point number
- DECIMAL or NUMERIC: Fixed-point number

2. Character String Type:

- CHAR(n): Fixed-length character string with maximum length of n
- VARCHAR(n): Variable-length character string with maximum length of n
- TEXT Type : Variable-length character string with no specified maximum length

3. Data and Time Type:

- DATE : for date only
- TIME: for time only
- DATETIME or TIMESTAMP: for date and time combined

4. Other Data type:

- NULL: to represent a missing/unknown/empty value
- ENUM: A enumeration type for a set of predefined values

Now let's learn datatype in detailed as per your syllabus

NUMERIC DATATYPE	INT/INTEGER	Signed range is from -2147483648 to 2147483647. Unsigned range is from 0 to 4294967295
	SMALLINT(SIZE)	SIGNED RANGE IS FROM -32768 TO 32767. UNSIGNED RANGE IS FROM 0 TO 65535
	TINYINT(SIZE)	SIGNED RANGE IS FROM -128 TO 127.UNSINED RANGE IS FROM 0 TO 255
	MEDIUMINT(SIZE)	SIGNED RANGE IS FROM -8388608 TO 8388607. UNSIGNED RANGE IS FROM 0 TO 16777215
	BIGINT(SIZE)	Signed range is from -9223372036854775808 to 9223372036854775807. Unsigned range is from 0 to 18446744073709551615
	FLOAT(SZ,D)	SZ IS SIZE AND D IS NO. OF DIGIT AFTER DECIMAL
STRING DATATYPE	CHAR(SIZE)	CHAR IS FIXED SIZED STRING AS PER SIZE DEFINED IN PARANTHESIS. SIZE OF CHAR DATATYPE IN RANGE OF 0 TO 255. BYDEFAULT SIZE OF CHAR IS 1
	VARCHAR(SIZE)	VARCHAR STANDS FOR VARIABLE LENGTH CHARACTER STRING RANGE OF VARCHAR IS 0 TO 65535

DATE AND TIME DATATYPE	DATE	AS THE NAME SUGGEST IT IS USED TO STORE DATE IN ANY ATTRIBUTE SUPPORTED FORMAT : YYYY-MM-DD
	TIME	USED TO STORE TIME IN ANY ATTRIBUTE SUPPORTED FORMAT : HH:MM:SS

Keys:

In database, keys is column/attribute which is used to fetch/extract/retrieve row in a table. Or we can say that Keys are used to uniquely identify records in a table through column or combination of column. To extract any particular row/record from a table, we need a key attribute which contain unique values.
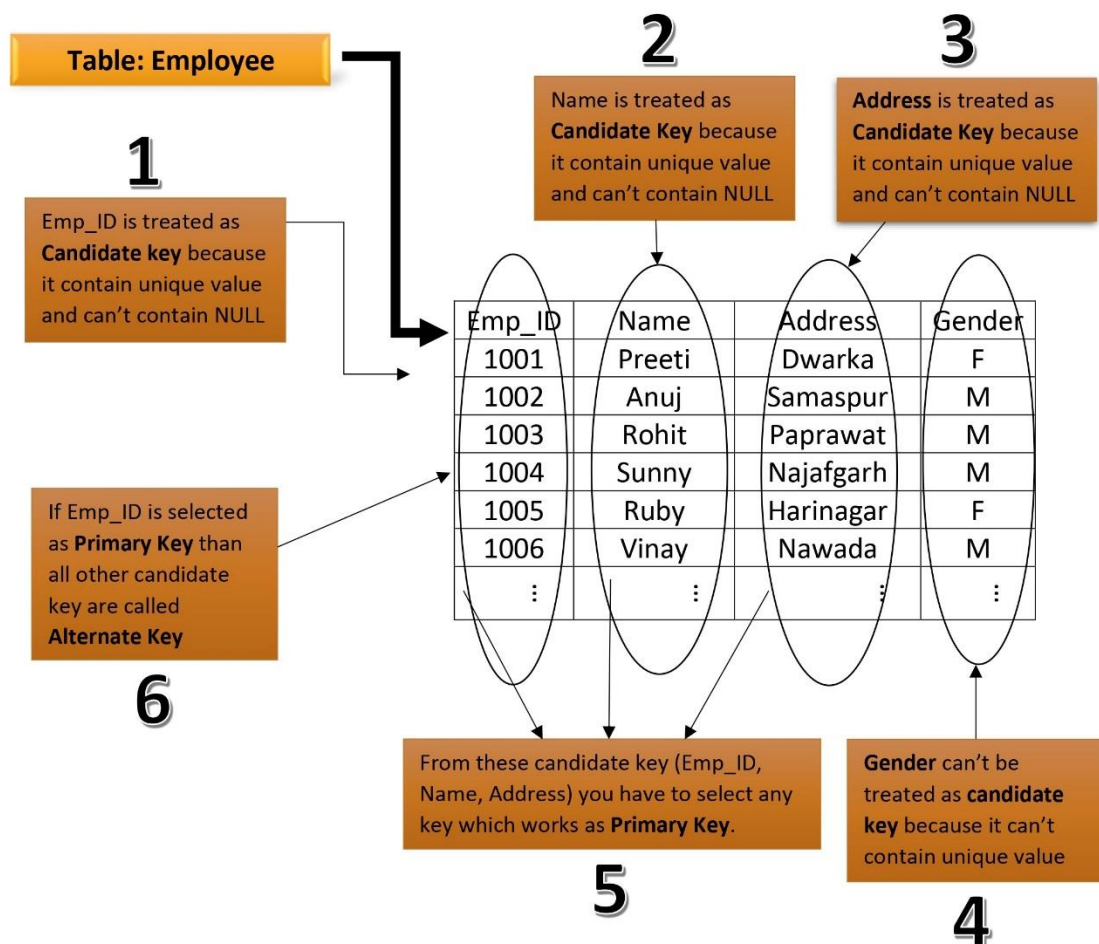
DIAGRAM: 5

KEYS IN TABLE (PLEASE READ IN ORDER OF NUMBER)

Primary Key:

Primary Key is a unique identifier which identify unique record in a particular table. It must contain unique values for each record. And Primary key attribute/column/field can't be NULL. A table can have only ONE primary key

Note: A Primary key must be a candidate key but not all candidate key are Primary key

Candidate Key:

Candidate key are those key which are eligible for primary key and can be used as primary key in a table.

Candidate key is a set of one or more column that could be used as primary key and from the set of these candidate key, one column is selected as primary key.

From Diagram 5, Candidate key can have more than one attribute like Emp_ID, Name, and Address etc.

Alternate Key:

After selecting primary key from candidate key, the remaining keys (which are also eligible for primary key) are called Alternate Key.

Foreign Key:

A Foreign key is a column or group of columns in a table that provides a link between two tables.

Let's see how actually foreign key work in table.
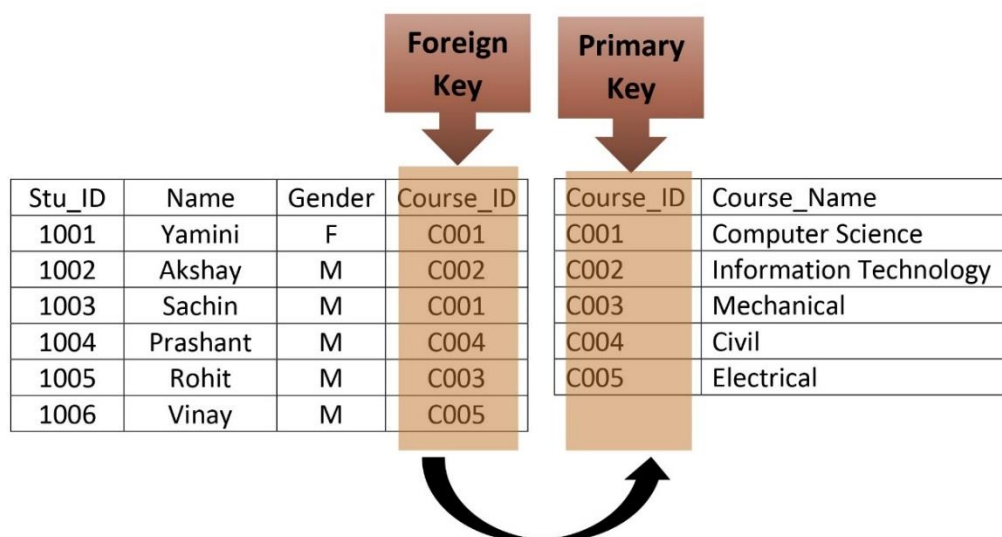
DIAGRAM: 6

HOW FOREIGN KEY WORKS BETWEEN TWO TABLES

It is an attribute whose values can be derived from primary key of some other table.

It ensure referential integrity. Referential Integrity is protocol which is used to ensure that relationship between record/row is valid and can't change in related data.

Structured Query Language:

Introduction:

SQL is shortened of Structured Query Language. And it is pronounced as See-Quell. SQL is used to manage database. SQL was developed in 1970 in IBM Laboratory and it became a standard of the ANSI (American National Standard Institute) in 1986.

SQL is query language not a database system. You are required to install DBMS software in your system to perform SQL Language operation with help to query Example – Oracle, MySQL, MongoDB, PostgreSQL, SQL Server, DB2 etc.

SQL is mainly used for maintaining the data in relational database management system. SQL provide interaction between user and database via set of standard commands.

In simple words, SQL is language that help user to communicate with databases. SQL is not case sensitive language means you can type your query in small or capital letter as per user.

DIAGRAM: 7
HOW SQL PROVIDE INTERACTION BETWEEN USER AND DATABASE

You may write comments in SQL using "--" (Double hyphen)

User may get information from a database file from required query. Query is a request in the form of SQL command to retrieve information with some condition. You will see lots of query performing different type of operations. SQL is query language (Query based language) which works on structured data (data in structured form).

Now let's discuss all the SQL Commands in categorized way.

SQL (STRUCTURED QUERY LANGUAGE) COMMANDS

DDL	DML	DCL	TCL
CREATE ALTER DROP TRUNCATE RENAME	SELECT INSERT UPDATE DELETE	COMMIT ROLLBACK SAVEPOINT	GRANT REVOKE
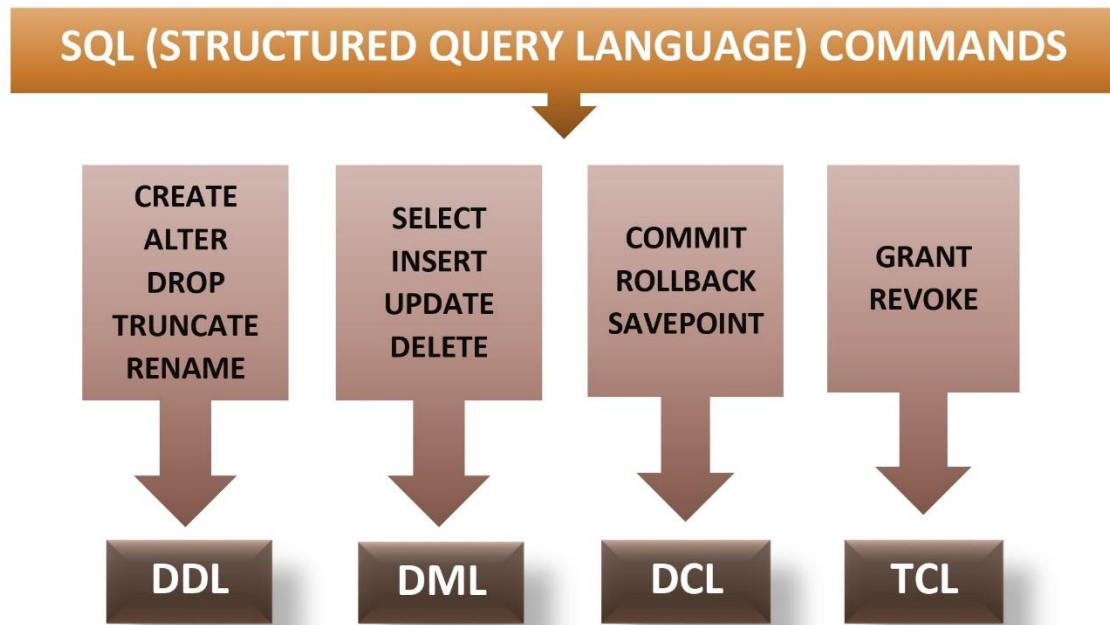
DIAGRAM: 8

SQL COMMANDS CAN BE CLASSIFIED INTO FOLLOWING CATEGORY

SQL perform following operation:

- Create a database
- Create a table
- Create view
- Insert data
- Update data
- Delete data
- Execute Query
- Set Permission or Constraints in table

SQL Commands:

SQL commands are predefined set of commands which are already defined in SQL. Commands are basically combination of keyword and statement you want to execute. Keywords are reserved words that has special meaning for SQL, you don't need to define they are already defined in SQL. All you need to use these keywords with you particular statements.

CLAUSE IN SQL:

Clause: Clause are built in functions which is use to deal with data inside the table that help SQL to filter and analyses data quickly.

CLAUSE IN SQL

WHERE CLAUSE — Used to select or filter rows based on particular valid condition. It is mainly used with SELECT, UPDATE AND DELETE

FROM CLAUSE — Used to mention name of table or source table from where you want to fetch/retrieve data. It is mainly used with SELECT

ORDER BY CLAUSE — Used to sort the result set in ascending order (by default). You can use DESC keyword to sort in descending order

GROUP BY CLAUSE — Used to group rows from a table based on one or more columns. It's mainly used with aggregate functions.

HAVING CLAUSE — Used to with GROUP BY clause to filter the result of a query based on aggregate function applied to grouped columns

LIKE CLAUSE — Used with WHERE clause to search for a specific pattern in a column. It uses wildcard (%,_) characters to match the strings

Any SQL statements is composed of two or more clause.

These clause are used with your SQL statements to filter commands you may learn in detail in further section. Some mainly used clause are discussed below.

NOTE: All SQL statements are terminated with (;) semicolon
SQL statements are not case sensitive means SQL treats both upper and lower case commands as same.

We are going to use these above clauses in our all types of commands in SQL.

Few basic SQL Commands:

Create databases:

To create a new database, create databases command is used.

SQL Syntax: create database <database name>;

```
mysql> create database test;
Query OK, 1 row affected (0.00 sec)
```

Show databases:

To view the list of available/created databases in SQL, *show databases* command is used.

SQL Syntax:

show databases;

```
mysql> show databases;
+--------------------+
| Database           |
+--------------------+
| information_schema |
| test               |
+--------------------+
2 rows in set (0.00 sec)
```

Use database:

To select a database among available databases, *use database* command is used.

SQL Syntax:

use <database_name>;

```
mysql> use test;
Database changed
mysql>
```

Show tables:

To view the list of available/created databases in SQL, *show tables* command is used.

SQL Syntax:

show tables;

```
mysql> show tables;
+----------------+
| Tables_in_test |
+----------------+
| abc1           |
| company        |
| demo1          |
| demo123        |
| employee       |
| equi           |
| equi1          |
| hello          |
| hello1         |
| student        |
+----------------+
10 rows in set (0.16 sec)
```

Create table:

To create a new table in the selected database. For example, if I want to create a table Student with following attributes and data types:

SQL Syntax:

create table <table name>(<attribute name> <data type> (size), <attribute name> <data type> (size) …);

Name of attribute	Data Type
Student_ID	int
Student_Name	char(30)
Age	int
Phone	int
Address	varchar(50)

```
mysql> create table student(
    -> Student_ID int,
    -> Student_Name char(30),
    -> Age int,
    -> Phone int,
    -> Address varchar(50));
Query OK, 0 rows affected (0.04 sec)
```

Describe table:

To view the structure of table (like attributes and its data types, keys, constraints, default values), desc command is used.

SQL Syntax:

desc <table name>;   **OR**   describe <table name>;

```
mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| Student_ID   | int(11)     | YES  |     | NULL    |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.09 sec)
```

Insert command:

To insert data in table, insert command is used (one row at a time). Here in this example, data of 4 students are inserted in table student.

SQL Syntax:

insert into <table name> values (<value>, <value> , <value> …);

```
mysql> insert into student values(1,'Amit',17,98769876,'delhi');
Query OK, 1 row affected (0.08 sec)

mysql> insert into student values(2,'Sonam',16,88769876,'gurugram');
Query OK, 1 row affected (0.06 sec)

mysql> insert into student values(3,'Mahesh',17,68769876,'jaipur');
Query OK, 1 row affected (0.08 sec)

mysql> insert into student values(4,'Priya',18,78769876,'noida');
Query OK, 1 row affected (0.11 sec)
```

Select command:

To show the data of a table, select command is used. Let's show the data of 4 students in student table that was inserted in the previous command.

SQL Syntax:

select * from <table name>;

```
mysql> select * from student;
+------------+--------------+------+----------+----------+
| Student_ID | Student_Name | Age  | Phone    | Address  |
+------------+--------------+------+----------+----------+
|          1 | Amit         |   17 | 98989998 | delhi    |
|          2 | Sonam        |   16 | 98989999 | delhi    |
|          3 | Madhu        |   17 | 88989999 | gurugram |
|          4 | Rahul        |   16 | 78989999 | Jaipur   |
+------------+--------------+------+----------+----------+
4 rows in set (0.06 sec)
```

Drop table command:

To delete data as well as structure of a table, drop command is used.

SQL Syntax:

drop table <table name>;

Drop database command:

To delete a database along with all the tables present in the database, drop command is used.

SQL Syntax:

drop database <database name>;

Constraints:

Constraints in SQL are set of rules that are applied to the data in a relation/table. Constraints are used to ensure the accuracy and reliability of the data. Constraints can be at column level or at table level. Column level constraints apply to a column, and table level constraints apply to the whole table. After applying constraints to the table, if any violation happens then the data can't be inserted or action can't be completed.

Types of constraints:

1. **Primary key**
2. **Unique**
3. **Not Null**
4. **Foreign Key**

Let's discuss in Details:

1. Primary Key Constraints:

NOT NULL+UNIQUE=Primary Key

This key applies unique and not null constraint to the column.

This constraints ensure that each column/attribute of table contain unique value for each row.

Let's learn with the help of example:

First we have created a table named student_demo and applying primary key constraints on roll_no attribute.

SQL Syntax:

create table <table_name>(<column_name> <datatype> <size> <constraint>);

Command:

create table student_demo(roll_no int(10) primary key,name varchar(20),subject varchar(20));

```
mysql> create table student_demo(roll_no int(10) primary key,name varchar(20),subject varchar(20));
Query OK, 0 rows affected (0.03 sec)

mysql> desc student_demo;
+---------+-------------+------+-----+---------+-------+
| Field   | Type        | Null | Key | Default | Extra |
+---------+-------------+------+-----+---------+-------+
| roll_no | int(10)     | NO   | PRI | NULL    |       |
| name    | varchar(20) | YES  |     | NULL    |       |
| subject | varchar(20) | YES  |     | NULL    |       |
+---------+-------------+------+-----+---------+-------+
3 rows in set (0.02 sec)
```

2. Unique Constraints :

NULL VALUES or (NOT NULL VALUES+UNIQUE) =UNIQUE

Unique constraint make sure that all values present or inserted in a column are different.

And this constraints follows all property of primary key constraints except that Primary key can't contain NULL values but unique constraints allows NULL values. It ensures that values in the column are unique across all rows.

NOTE: You can have more than one unique key but only one primary key

SQL Syntax: alter table <table_name> add <constraints_name>(<column_name>);

Command: alter table student add unique(standard);

```
mysql> alter table student add unique(standard);
Query OK, 0 rows affected (0.03 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Let's see table schema after applying above code:

```
mysql> desc student;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| roll_no  | int(11)     | NO   |     | NULL    |       |
| std_name | varchar(50) | NO   | PRI |         |       |
| standard | varchar(20) | YES  | UNI | NULL    |       |
| subject  | varchar(30) | YES  |     | NULL    |       |
| gender   | char(1)     | YES  |     | M       |       |
+----------+-------------+------+-----+---------+-------+
5 rows in set (0.02 sec)
```

As you can see Unique Key constraints assigned to attribute/Field named standard. Which means standard column hold unique value.

Now as we know standard attribute can only hold unique value. If we attempt to insert duplicate values in standard attribute. This may occur an error. Let's see how

```
mysql> select * from student;
+---------+----------+----------+--------------------------+--------+
| roll_no | std_name | standard | subject                  | gender |
+---------+----------+----------+--------------------------+--------+
|       2 | Mohit    | 11th A   | Informatics Practices    | M      |
|       1 | Rohit    | 11th F   | data structure           | M      |
|       3 | Sarika   | 10th A   | Information Technologies  | F      |
+---------+----------+----------+--------------------------+--------+
3 rows in set (0.00 sec)

mysql> insert into student values(4,"Gaurav","11th A","Java","M");
ERROR 1062 (23000): Duplicate entry '11th A' for key 'standard'
```

Now we are going to enter a valid entry in student table. Let's see

```
mysql> insert into student values(4,"Gaurav","11th B","Java","M");
Query OK, 1 row affected (0.02 sec)

mysql> select * from student;
+---------+----------+----------+--------------------------+--------+
| roll_no | std_name | standard | subject                  | gender |
+---------+----------+----------+--------------------------+--------+
|       4 | Gaurav   | 11th B   | Java                     | M      |
|       2 | Mohit    | 11th A   | Informatics Practices    | M      |
|       1 | Rohit    | 11th F   | data structure           | M      |
|       3 | Sarika   | 10th A   | Information Technologies  | F      |
+---------+----------+----------+--------------------------+--------+
4 rows in set (0.00 sec)
```

As you can see all entry are clearly affected in table student. Now we need to check that standard attribute allows NULL values. Let's understand with SQL command.

```
mysql> insert into student values(4,"Anuj",NULL,"C#","M");
Query OK, 1 row affected (0.02 sec)
```

```
mysql> insert into student values(4,"Anuj",NULL,"C#","M");
Query OK, 1 row affected (0.02 sec)

mysql> select * from student;
+---------+----------+----------+-------------------------+--------+
| roll_no | std_name | standard | subject                 | gender |
+---------+----------+----------+-------------------------+--------+
|       4 | Anuj     | NULL     | C#                      | M      |
|       4 | Gaurav   | 11th B   | Java                    | M      |
|       2 | Mohit    | 11th A   | Informatics Practices   | M      |
|       1 | Rohit    | 11th F   | data structure          | M      |
|       3 | Sarika   | 10th A   | Information Technologies | F      |
+---------+----------+----------+-------------------------+--------+
5 rows in set (0.00 sec)
```

3. NOT NULL Constraints : Which never accept NULL values

NOT NULL constraints ensures that columns in table does not contain any NULL values. NULL values means missing or unknown values. If you enforce this NOT NULL constraints to any attribute than you are not able to insert any NULL values in it. Let's see how.

In student table, only two attribute assigned with NOT NULL constraint, first one is roll_no and std_name which means that these column can't accept NULL values
Now we enforce NOT NULL constraint to another column named subject in existing table student.

```
mysql> desc student;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| roll_no  | int(11)     | NO   |     | NULL    |       |
| std_name | varchar(50) | NO   | PRI |         |       |
| standard | varchar(20) | YES  | UNI | NULL    |       |
| subject  | varchar(30) | YES  |     | NULL    |       |
| gender   | char(1)     | YES  |     | M       |       |
+----------+-------------+------+-----+---------+-------+
5 rows in set (0.03 sec)

mysql> alter table student modify subject varchar(30) not null;
Query OK, 0 rows affected (0.10 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

As you can command is successfully executed. Let's see the schema of the table to check NOT NULL constraint successfully applied on subject column.
In below diagram it is clearly shows that subject NULL Type is set to NO means you can't insert NULL value.

After that we have to check by insert a command with NULL values whether the subject column is accepting NULL value or not. Let's see

```
mysql> desc student;
+----------+-------------+------+-----+---------+-------+
| Field    | Type        | Null | Key | Default | Extra |
+----------+-------------+------+-----+---------+-------+
| roll_no  | int(11)     | NO   |     | NULL    |       |
| std_name | varchar(50) | NO   | PRI |         |       |
| standard | varchar(20) | YES  | UNI | NULL    |       |
| subject  | varchar(30) | NO   |     | NULL    |       |
| gender   | char(1)     | YES  |     | M       |       |
+----------+-------------+------+-----+---------+-------+
5 rows in set (0.02 sec)

mysql> insert into student values(11,"Anaaya","1st A",NULL,"F");
ERROR 1048 (23000): Column 'subject' cannot be null
```

As you can there is error occur that column 'subject' cannot be null

Now we try to insert a another command in the student table and check whether the insertion is successful or not

```
mysql> insert into student values(11,"Anaaya","8th A","AI","F");
Query OK, 1 row affected (0.01 sec)

mysql> select * from student;
+---------+----------+----------+-------------------------+--------+
| roll_no | std_name | standard | subject                 | gender |
+---------+----------+----------+-------------------------+--------+
|      11 | Anaaya   | 8th A    | AI                      | F      |
|       4 | Anuj     | NULL     | C#                      | M      |
|       4 | Gaurav   | 11th B   | Java                    | M      |
|       2 | Mohit    | 11th A   | Informatics Practices   | M      |
|       1 | Rohit    | 11th F   | data structure          | M      |
|       3 | Sarika   | 10th A   | Information Technologies | F      |
|       4 | Vinay    | 12th E   | C++                     | NULL   |
+---------+----------+----------+-------------------------+--------+
7 rows in set (0.00 sec)
```

4. Foreign Key:

In Foreign Key constraints, unique, not null and primary key constraint applies to a single table where as foreign key constraint applies to two tables.

For example: we have two tables' student and awards as follows:

Table: Student

ID	Name	Age	City
1	Amit	15	Delhi
2	Madhu	14	Gurugram
3	Manoj	15	Noida
4	Asif	15	Faridabad

Table: Awards

ID	Award	Sport
1	Gold	Badminton
2	Silver	Tennis
1	Silver	Hockey
4	Bronze	Badminton

Here we will establish foreign key constraint on column **ID** of **student table** and column **id** of **awards table.** Here we will consider **Student table** as **parent table** and **Awards table** as **child table.** Following rules must be followed:

(a) Column ID of Student table must be its primary key.

(b) Column ID of Awards table may or may not be primary key of Awards table.

- Foreign key constraint ensures that only that data can be inserted in column ID of Awards table which is present in column ID of Student table.

Example: We will create two tables. **Student table** as **parent table** and **Awards table** as **child table**. Now we will establish foreign key constraint on column **ID** of **student table** and column **id** of **awards table.**

```
mysql> create table Student(ID int primary key,
    -> Name char(20),Class char(20),Phone int);
Query OK, 0 rows affected (0.12 sec)
mysql> create table Awards(ID int,Event char(20),
    -> foreign key(ID) references Student(ID));
Query OK, 0 rows affected (0.16 sec)
```

Now let's check how foreign key constraint works. We have already added data in Student table.

```
mysql> select * from Student;
+-----+--------+-------+--------+
| ID  | Name   | Class | Phone  |
+-----+--------+-------+--------+
|   1 | Rahul  | X     |  12345 |
|   2 | Mahima | XII   | 222345 |
|   3 | Gauri  | XI    | 322345 |
|   4 | Mohan  | XI    | 622345 |
+-----+--------+-------+--------+
4 rows in set (0.00 sec)
```

Now let's check how foreign key constraint enforces referential integrity.

```
mysql> create table Awards(ID int,Event char(20),
    -> foreign key(ID) references Student(ID));
Query OK, 0 rows affected (0.16 sec)

mysql> insert into Awards values(1,'cricket');
Query OK, 1 row affected (0.06 sec)

mysql> insert into Awards values(2,'football');
Query OK, 1 row affected (0.09 sec)

mysql> insert into Awards values(5,'khokho');
ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint fails
s_ibfk_1' FOREIGN KEY ('ID') REFERENCES 'student' ('ID'))
```

Here we can see that ID 5 is not present in parent table (Student). So, ID 5 can't be added in child table (Awards).

DDL (Data Definition Language) Commands:

These commands are used to make any changes in the structure of the table/database. These command don't change the data of the table.

Example: create table, alter table, drop table, create database, create view etc.

We have already covered few DDL Commands like create database, create table, drop database, drop table. Few more DDL commands like alter table will be discussed now.

Alter Table:
This is a DDL command and it is used to modify a table. This command can be used to add, delete, or modify columns, add or drop constraints etc.
SQL Syntax:
alter table <table name> [alter option];

Add a column to the table:

We have table student which was created in previous section.

```
mysql> select * from student;
+------------+--------------+------+----------+----------+
| Student_ID | Student_Name | Age  | Phone    | Address  |
+------------+--------------+------+----------+----------+
|          1 | Amit         |   17 | 98769876 | delhi    |
|          2 | Sonam        |   16 | 88769876 | gurugram |
|          3 | Mahesh       |   17 | 68769876 | jaipur   |
|          4 | Priya        |   18 | 78769876 | noida    |
+------------+--------------+------+----------+----------+
4 rows in set (0.00 sec)
```

SQL Syntax:
alter table <table name> add <column name><data type> [constraint];

Example: If we want to add a column class with data type varchar and size 50 and nulls are not allowed.

```
mysql> alter table student add class varchar(50) not null;
Query OK, 4 rows affected (0.33 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> select * from student;
+------------+--------------+------+----------+----------+-------+
| Student_ID | Student_Name | Age  | Phone    | Address  | class |
+------------+--------------+------+----------+----------+-------+
|          1 | Amit         |   17 | 98769876 | delhi    |       |
|          2 | Sonam        |   16 | 88769876 | gurugram |       |
|          3 | Mahesh       |   17 | 68769876 | jaipur   |       |
|          4 | Priya        |   18 | 78769876 | noida    |       |
+------------+--------------+------+----------+----------+-------+
4 rows in set (0.00 sec)
```

Drop a column from the table:
Let's delete a column class from table student which we added in the previous section.
SQL Syntax:
alter table <table name> drop column<column name>;

Modifying column of a table:
We have different ways to modify a table like column name, data type, default value, size, order of column, constraints.

1. **Changing column name:** We can change the column name of a table using alter command. For example, in table student, we are going to change column name Student_ID to ID.
   SQL Syntax:
   alter table <table name> change column <old column name> <new column name> <data type>;

2. **Changing column data type:** We can change the column data type from varchar to char or int to varchar etc. of a table using alter command. For example, in table student, we are going to change datatype of column ID from int to varchar.
   SQL Syntax:
   alter table <table name> change column <column name><new data type>;

```
mysql> alter table student modify column ID varchar(50);
Query OK, 4 rows affected (0.48 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(50) | YES  |     | NULL    |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.01 sec)
```

3. **Changing maximum size of the data in a column:** We can change the maximum size of the data in a column of a table using alter command. For example, in table student, we are going to change size of column ID from varchar(50) to varchar(40).
   SQL Syntax:
   alter table <table name> change column <column name> <data type with size>;

```
mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(50) | YES  |     | NULL    |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.01 sec)


mysql> alter table student modify column ID varchar(40);
Query OK, 4 rows affected (0.31 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(40) | YES  |     | NULL    |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

4. **Changing order of the column:** We can change the order of the column of a table using alter command. For example, in table student, we are going to place column ID after column Age.
   SQL Syntax:
   alter table <table name> modify <column name> <data type with size>[first|after] <column name>;

```
mysql> select * from student;
+-----+--------------+------+----------+----------+
| ID  | Student_Name | Age  | Phone    | Address  |
+-----+--------------+------+----------+----------+
| 1   | Amit         | 17   | 98769876 | delhi    |
| 2   | Sonam        | 16   | 88769876 | gurugram |
| 3   | Mahesh       | 17   | 68769876 | jaipur   |
| 4   | Priya        | 18   | 78769876 | noida    |
+-----+--------------+------+----------+----------+
4 rows in set (0.00 sec)


mysql> alter table student modify ID varchar(40) after Age;
Query OK, 4 rows affected (0.23 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> select * from student;
+--------------+------+-----+----------+----------+
| Student_Name | Age  | ID  | Phone    | Address  |
+--------------+------+-----+----------+----------+
| Amit         | 17   | 1   | 98769876 | delhi    |
| Sonam        | 16   | 2   | 88769876 | gurugram |
| Mahesh       | 17   | 3   | 68769876 | jaipur   |
| Priya        | 18   | 4   | 78769876 | noida    |
+--------------+------+-----+----------+----------+
4 rows in set (0.00 sec)
```

Now we are going to put column ID back to first position.

```
mysql> select * from student;
+--------------+------+-----+----------+----------+
| Student_Name | Age  | ID  | Phone    | Address  |
+--------------+------+-----+----------+----------+
| Amit         | 17   | 1   | 98769876 | delhi    |
| Sonam        | 16   | 2   | 88769876 | gurugram |
| Mahesh       | 17   | 3   | 68769876 | jaipur   |
| Priya        | 18   | 4   | 78769876 | noida    |
+--------------+------+-----+----------+----------+
4 rows in set (0.00 sec)


mysql> alter table student modify ID varchar(40) first;
Query OK, 4 rows affected (0.27 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> select * from student;
+-----+--------------+------+----------+----------+
| ID  | Student_Name | Age  | Phone    | Address  |
+-----+--------------+------+----------+----------+
| 1   | Amit         | 17   | 98769876 | delhi    |
| 2   | Sonam        | 16   | 88769876 | gurugram |
| 3   | Mahesh       | 17   | 68769876 | jaipur   |
| 4   | Priya        | 18   | 78769876 | noida    |
+-----+--------------+------+----------+----------+
4 rows in set (0.00 sec)
```

5. **Add/drop constraints/column:** We can add/drop constraints in a table using alter command.

   ➢ **Adding primary key**: We are going to add primary key at column ID using alter command.

   Command: alter table <table name> add primary key(<column name>);

```
mysql> alter table student add primary key(ID);
Query OK, 4 rows affected (0.51 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(40) | NO   | PRI |         |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.16 sec)
```

> **Dropping primary key:** We are going to remove primary key at column ID which we added in the previous section.
> **Command:** alter table <table name> drop primary key;

```
mysql> alter table student drop primary key;
Query OK, 4 rows affected (0.22 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(40) | NO   |     |         |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

> **Adding a new column:** We are going to add a column country with data type char of size 50 to the table student using alter command.
> **Command:** alter table <table name> add column <column name> <data type with size>;

```
mysql> alter table student add_column country char(50);
Query OK, 4 rows affected (0.27 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(40) | NO   |     |         |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
| country      | char(50)    | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
6 rows in set (0.01 sec)
```

> **Dropping a column:** We are going to remove a column 'country' which we added in the last section using alter command.
> **Command:** alter table <table name> drop column <column name>;

```
mysql> alter table student drop column country;
Query OK, 4 rows affected (0.31 sec)
Records: 4  Duplicates: 0  Warnings: 0

mysql> desc student;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| ID           | varchar(40) | NO   |     |         |       |
| Student_Name | char(30)    | YES  |     | NULL    |       |
| Age          | int(11)     | YES  |     | NULL    |       |
| Phone        | int(11)     | YES  |     | NULL    |       |
| Address      | varchar(50) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.01 sec)
```

DML (Data Manipulation Language) Commands:

These commands are used to make any changes in the data of the table.

DML commands: Insert, delete, update, select etc.

We have already covered few DML Commands like insert and select. Now we will discuss delete and update command.

Delete command:

Delete command is used to delete data from the table. **Where clause is used to give condition in a SQL query.** All those tuples which satisfies the condition will be deleted from the table.
SQL Syntax:
delete from <table name> where <condition>;
Now let's delete data of all those students from student table whose ID is greater than 5.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | delhi    |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
| 6  | Raju         | 18   | 98769877 | noida    |
| 7  | Kirti        | 19   | 98769875 | delhi    |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

```
mysql> delete from student where ID>5;
Query OK, 2 rows affected (0.13 sec)

mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | delhi    |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
+----+--------------+------+----------+----------+
5 rows in set (0.00 sec)
```

<u>Update command</u>: Update command is used to update data from the table. **Where clause is used to give condition in a SQL query.** All those tuples which satisfies the condition will be update from the table.

SQL Syntax:

update <table name> set <column name>=<new data> where <condition>;

Now let's update the Address from 'Delhi' to 'Sonipat' of that student whose name is 'Amit'.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | delhi    |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
+----+--------------+------+----------+----------+
5 rows in set (0.00 sec)
```

```
mysql> update student set Address='Sonipat' where Student_Name='Amit';
Query OK, 1 row affected (0.09 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
+----+--------------+------+----------+----------+
5 rows in set (0.00 sec)
```

Aliasing:

Aliasing in SQL is the process of assigning a nick name or a temporary name to a table or column. We create aliases to make queries more readable and easier to use. Alias created using **as** keyword. Creating aliases don't change name of any table or column permanently.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
+----+--------------+------+----------+----------+
5 rows in set (0.00 sec)
```

```
mysql> select ID, Student_Name as Name from student;
+----+---------+
| ID | Name    |
+----+---------+
|  1 | Amit    |
|  2 | Sonam   |
|  3 | Mahesh  |
|  4 | Priya   |
|  5 | Monika  |
+----+---------+
5 rows in set (0.06 sec)
```

Distinct clause:

Distinct clause is used to remove duplicate values from the table. As we studied earlier, changes in data of a table is done using delete and update command. So, removing duplicate values using distinct clause is temporary and only reflected during output. Distinct clause can be used for more than one column.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
|  1 | Amit         |   17 | 98769876 | Sonipat  |
|  2 | Sonam        |   16 | 88769876 | gurugram |
|  3 | Mahesh       |   17 | 68769876 | jaipur   |
|  4 | Priya        |   18 | 78769876 | noida    |
|  5 | Monika       |   17 | 98769876 | delhi    |
|  1 | Ajay         |   17 | 98769857 | jaipur   |
|  3 | sonal        |   18 | 94769857 | noida    |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

Here in student table, two duplicate ID's 1 and 3 are present. Now using distinct clause we can get only unique values.

```
mysql> select distinct(ID) from student;
+----+
| ID |
+----+
|  1 |
|  2 |
|  3 |
|  4 |
|  5 |
+----+
5 rows in set (0.00 sec)
```

As we can see that all duplicate ID's are removed but it is temporary. Duplicate values are not removed and still present in the table.

Where clause:

The WHERE clause in SQL is used to filter the results of a SELECT statement by specifying one or more conditions. All those tuples which meets the condition will be included in the final result.

The WHERE clause is a very powerful technique to select particular rows from a table. It can be used to filter by the values in a column, by the values in multiple columns, or by the outcome of any calculation.

Uses of where clause:

- Where clause can be used with select statement to filter the result.

- Where clause can be used with update statement to update the data of table that matches with the condition.

- Where clause can be used with delete statement to delete the rows of table that matches with the condition.

SQL Syntax:

where <condition>;

Examples:

1. To filter the result based on only one condition:

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
| 1  | Ajay         | 17   | 98769857 | jaipur   |
| 3  | sonal        | 18   | 94769857 | noida    |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)

mysql> select * from student where age<=17;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 5  | Monika       | 17   | 98769876 | delhi    |
| 1  | Ajay         | 17   | 98769857 | jaipur   |
+----+--------------+------+----------+----------+
5 rows in set (0.05 sec)
```

2. To filter the result based on multiple condition:

```
mysql> select * from student where age<=17 and Address='jaipur';
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 3  | Mahesh       |   17 | 68769876 | jaipur  |
| 1  | Ajay         |   17 | 98769857 | jaipur  |
+----+--------------+------+----------+---------+
2 rows in set (0.06 sec)
```

In clause and not in clause:

In sql, **in clause** and **not in clause** is used to filter the rows in output based on list of values.

Syntax for in clause:

where <column name> in (item1, item2,…);

Syntax for not in clause:

where <column name> not in (item1, item2,…);

Example of in clause: if we want to find the data of those students who lives in either delhi or Jaipur or gurugram. Now to solve this problem, we have two ways. Either we write multiple comparison using **or keyword** or we can use **in clause**. Now you will see that using in clause for comparing with a list of items is an easy option.

```
mysql> select * from student where Address='delhi' or Address='jaipur' or Address='gurugram';
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 2  | Sonam        |   16 | 88769876 | gurugram |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 1  | Ajay         |   17 | 98769857 | jaipur   |
+----+--------------+------+----------+----------+
4 rows in set (0.00 sec)

mysql> select * from student where Address in ('delhi','jaipur','gurugram');
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 2  | Sonam        |   16 | 88769876 | gurugram |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 1  | Ajay         |   17 | 98769857 | jaipur   |
+----+--------------+------+----------+----------+
4 rows in set (0.05 sec)
```

Example of not in clause: if we want to find the data of those students who don't lives in delhi or Jaipur or gurugram.

```
mysql> select * from student where Address not in ('delhi','jaipur','gurugram');
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 1  | Amit         |   17 | 98769876 | Sonipat |
| 4  | Priya        |   18 | 78769876 | noida   |
| 3  | sonal        |   18 | 94769857 | noida   |
+----+--------------+------+----------+---------+
3 rows in set (0.02 sec)
```

Between Clause:

It is used to filter the rows in output based on the range of values.

SQL Syntax:

where <column name> between <starting value> and <ending value>;

Note: The final result of between clause filters the rows of the table based on range of values including starting and ending value.

```
mysql> select * from student where age between 17 and 18;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         |   17 | 98769876 | Sonipat  |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 4  | Priya        |   18 | 78769876 | noida    |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 1  | Ajay         |   17 | 98769857 | jaipur   |
| 3  | sonal        |   18 | 94769857 | noida    |
+----+--------------+------+----------+----------+
6 rows in set (0.05 sec)
```

Order by Clause: It is used to sort the output of the select statement in ascending or descending order.

SQL Syntax:

order by <column name> [ASC|DESC];

Note: If not mentioned, by default it will sort the output in ascending order. So, if you want to sort the data in ascending order, you need not to mention the order of sorting.

```
mysql> select * from student order by Student_Name;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Ajay         |   17 | 98769857 | jaipur   |
| 1  | Amit         |   17 | 98769876 | Sonipat  |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 4  | Priya        |   18 | 78769876 | noida    |
| 3  | sonal        |   18 | 94769857 | noida    |
| 2  | Sonam        |   16 | 88769876 | gurugram |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

```
mysql> select * from student order by Student_Name ASC;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Ajay         | 17   | 98769857 | jaipur   |
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 5  | Monika       | 17   | 98769876 | delhi    |
| 4  | Priya        | 18   | 78769876 | noida    |
| 3  | sonal        | 18   | 94769857 | noida    |
| 2  | Sonam        | 16   | 88769876 | gurugram |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

```
mysql> select * from student order by Student_Name DESC;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 3  | sonal        | 18   | 94769857 | noida    |
| 4  | Priya        | 18   | 78769876 | noida    |
| 5  | Monika       | 17   | 98769876 | delhi    |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 1  | Ajay         | 17   | 98769857 | jaipur   |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

We can sort multiple columns together in ASC and DESC order.

```
mysql> select * from student order by Address DESC,Student_Name ASC;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         | 17   | 98769876 | Sonipat  |
| 4  | Priya        | 18   | 78769876 | noida    |
| 3  | sonal        | 18   | 94769857 | noida    |
| 1  | Ajay         | 17   | 98769857 | jaipur   |
| 3  | Mahesh       | 17   | 68769876 | jaipur   |
| 2  | Sonam        | 16   | 88769876 | gurugram |
| 5  | Monika       | 17   | 98769876 | delhi    |
+----+--------------+------+----------+----------+
7 rows in set (0.06 sec)
```

NULL:

In SQL, null is a special value which means absence of value or a field doesn't has a value. Null doesn't mean zero. Null also doesn't mean empty string. Null is a kind of placeholder of that value which is not present or not known.

Example: If the phone number of a student is not known at present, so we can store NULL instead of zero or make it empty.

```
mysql> insert into student values(6,'Tanya',16,NULL,'delhi');
Query OK, 1 row affected (0.09 sec)

mysql> select * from student;
+----+--------------+------+-----------+----------+
| ID | Student_Name | Age  | Phone     | Address  |
+----+--------------+------+-----------+----------+
|  1 | Amit         |   17 | 98769876  | Sonipat  |
|  2 | Sonam        |   16 | 88769876  | gurugram |
|  3 | Mahesh       |   17 | 68769876  | jaipur   |
|  4 | Priya        |   18 | 78769876  | noida    |
|  5 | Monika       |   17 | 98769876  | delhi    |
|  1 | Ajay         |   17 | 98769857  | jaipur   |
|  3 | sonal        |   18 | 94769857  | noida    |
|  6 | Tanya        |   16 |      NULL | delhi    |
+----+--------------+------+-----------+----------+
8 rows in set (0.00 sec)
```

IS NULL Clause:

IS NULL clause is used to check that value in particular column is NULL value

Example: To find out name of students whose phone number is NULL.

```
mysql> select * from student where Phone is null;
+----+--------------+------+-------+---------+
| ID | Student_Name | Age  | Phone | Address |
+----+--------------+------+-------+---------+
|  6 | Tanya        |   16 | NULL  | delhi   |
+----+--------------+------+-------+---------+
1 row in set (0.02 sec)
```

Note: is keyword is used to compare values of a column with **NULL**.

IS NOT NULL Clause:

IS NULL clause is used to check that value in particular column is not NULL value

Example: To find out name of students whose phone number is not NULL.

```
mysql> select * from student where Phone is not null;
+----+--------------+------+-----------+----------+
| ID | Student_Name | Age  | Phone     | Address  |
+----+--------------+------+-----------+----------+
|  1 | Amit         |   17 | 98769876  | Sonipat  |
|  2 | Sonam        |   16 | 88769876  | gurugram |
|  3 | Mahesh       |   17 | 68769876  | jaipur   |
|  4 | Priya        |   18 | 78769876  | noida    |
|  5 | Monika       |   17 | 98769876  | delhi    |
|  1 | Ajay         |   17 | 98769857  | jaipur   |
|  3 | sonal        |   18 | 94769857  | noida    |
+----+--------------+------+-----------+----------+
7 rows in set (0.00 sec)
```

Like operator:

Like operator is used to match a pattern. The like operator is used with were clause. Like operator has 2 wildcards:

1. **_ (underscore):** It is used to match one character.

2. **% (percentage sign)**: It is used to match zero or more characters.

Example 1: To match a string that starts with 's', its pattern will be 's%'. As we don't know how many characters are there after 's', so '%' sign is used after 's'.

```
mysql> select * from student where Student_Name like 's%';
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 2  | Sonam        |   16 | 88769876 | gurugram |
| 3  | sonal        |   18 | 94769857 | noida    |
+----+--------------+------+----------+----------+
2 rows in set (0.00 sec)
```

Example 2: To match a string that ends with 'a', its pattern will be '%a'. As we don't know how many characters are there before 'a', so '%' sign is used before 'a'.

```
mysql> select * from student where Student_Name like '%a';
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 4  | Priya        |   18 | 78769876 | noida   |
| 5  | Monika       |   17 | 98769876 | delhi   |
| 6  | Tanya        |   16 |     NULL | delhi   |
+----+--------------+------+----------+---------+
3 rows in set (0.00 sec)
```

Example 3: To match a string that contains with 'a', its pattern will be '%a%'. As we don't know how many characters are there before or after 'a', so '%' sign is used before and after 'a'.

```
mysql> select * from student where Student_Name like '%a%';
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         |   17 | 98769876 | Sonipat  |
| 2  | Sonam        |   16 | 88769876 | gurugram |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 4  | Priya        |   18 | 78769876 | noida    |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 1  | Ajay         |   17 | 98769857 | jaipur   |
| 3  | sonal        |   18 | 94769857 | noida    |
| 6  | Tanya        |   16 |     NULL | delhi    |
+----+--------------+------+----------+----------+
8 rows in set (0.00 sec)
```

Example 4: To match a string that has letter 'a' at second position, its pattern will be '_a%'. As we know there must be exact one character before 'a' and we don't know how many characters are there after 'a', so '_' sign is used before 'a' and '%' sign is used after 'a'.

```
mysql> select * from student where Student_Name like '_a%';
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 3  | Mahesh       |   17 | 68769876 | jaipur  |
| 6  | Tanya        |   16 |     NULL | delhi   |
+----+--------------+------+----------+---------+
2 rows in set (0.00 sec)
```

Example 5: To match a string that has exactly 5 character, its pattern will be '_ _ _ _ _'. As we know there must be exact 5 character, so '_' sign is used 5 times.

```
mysql> select * from student where Address like '_____';
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 4  | Priya        |   18 | 78769876 | noida   |
| 5  | Monika       |   17 | 98769876 | delhi   |
| 3  | sonal        |   18 | 94769857 | noida   |
| 6  | Tanya        |   16 |     NULL | delhi   |
+----+--------------+------+----------+---------+
4 rows in set (0.00 sec)
```

Example 6: To match a string that has exactly 7 character and ends with 't', its pattern will be '_ _ _ _ _ _ t'. As we know there must be exact 7 character, so '_' sign is used 6 times before 't'.

```
mysql> select * from student where Address like '_____t';
+----+--------------+------+----------+---------+
| ID | Student_Name | Age  | Phone    | Address |
+----+--------------+------+----------+---------+
| 1  | Amit         |   17 | 98769876 | Sonipat |
+----+--------------+------+----------+---------+
1 row in set (0.00 sec)
```

Update Command:

It is used to update the existing data in a table.

SQL Syntax:

update <table name> set <column name> = <new data> where <condition>;

Example 1: Let's update the Age to 18 of that student whose name is Amit.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         |   17 | 98769876 | Sonipat  |
| 2  | Sonam        |   16 | 88769876 | gurugram |
| 3  | Mahesh       |   17 | 68769876 | jaipur   |
| 4  | Priya        |   18 | 78769876 | noida    |
| 5  | Monika       |   17 | 98769876 | delhi    |
| 1  | Ajay         |   17 | 98769857 | jaipur   |
| 3  | sonal        |   18 | 94769857 | noida    |
| 6  | Tanya        |   16 |     NULL | delhi    |
+----+--------------+------+----------+----------+
8 rows in set (0.00 sec)
```

```
mysql> update student set Age=18 where Student_Name='Amit';
Query OK, 1 row affected (0.09 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from student;
+------+--------------+------+-----------+-----------+
| ID   | Student_Name | Age  | Phone     | Address   |
+------+--------------+------+-----------+-----------+
| 1    | Amit         | 18   | 98769876  | Sonipat   |
| 2    | Sonam        | 16   | 88769876  | gurugram  |
| 3    | Mahesh       | 17   | 68769876  | jaipur    |
| 4    | Priya        | 18   | 78769876  | noida     |
| 5    | Monika       | 17   | 98769876  | delhi     |
| 1    | Ajay         | 17   | 98769857  | jaipur    |
| 3    | sonal        | 18   | 94769857  | noida     |
| 6    | Tanya        | 16   |     NULL  | delhi     |
+------+--------------+------+-----------+-----------+
8 rows in set (0.01 sec)
```

Example 2: Let's update the city to delhi of that student whose ID is 1 and Age is 17.

```
mysql> select * from student;
+------+--------------+------+-----------+-----------+
| ID   | Student_Name | Age  | Phone     | Address   |
+------+--------------+------+-----------+-----------+
| 1    | Amit         | 18   | 98769876  | Sonipat   |
| 2    | Sonam        | 16   | 88769876  | gurugram  |
| 3    | Mahesh       | 17   | 68769876  | jaipur    |
| 4    | Priya        | 18   | 78769876  | noida     |
| 5    | Monika       | 17   | 98769876  | delhi     |
| 1    | Ajay         | 17   | 98769857  | jaipur    |
| 3    | sonal        | 18   | 94769857  | noida     |
| 6    | Tanya        | 16   |     NULL  | delhi     |
+------+--------------+------+-----------+-----------+
8 rows in set (0.01 sec)

mysql> update student set Address='delhi' where ID=1 and Age=17;
Query OK, 1 row affected (0.11 sec)
Rows matched: 1  Changed: 1  Warnings: 0

mysql> select * from student;
+------+--------------+------+-----------+-----------+
| ID   | Student_Name | Age  | Phone     | Address   |
+------+--------------+------+-----------+-----------+
| 1    | Amit         | 18   | 98769876  | Sonipat   |
| 2    | Sonam        | 16   | 88769876  | gurugram  |
| 3    | Mahesh       | 17   | 68769876  | jaipur    |
| 4    | Priya        | 18   | 78769876  | noida     |
| 5    | Monika       | 17   | 98769876  | delhi     |
| 1    | Ajay         | 17   | 98769857  | delhi     |
| 3    | sonal        | 18   | 94769857  | noida     |
| 6    | Tanya        | 16   |     NULL  | delhi     |
+------+--------------+------+-----------+-----------+
8 rows in set (0.00 sec)
```

Delete Command:

It is used to delete the existing rows in a table that matches the condition.

SQL Syntax:

delete from <table name> where <condition>;

Example 1: Let's delete data of those students whose ID is 1 but age is not 18.

```
mysql> select * from student;
+------+---------------+------+-----------+----------+
| ID   | Student_Name  | Age  | Phone     | Address  |
+------+---------------+------+-----------+----------+
|  1   | Amit          |  18  | 98769876  | Sonipat  |
|  2   | Sonam         |  16  | 88769876  | gurugram |
|  3   | Mahesh        |  17  | 68769876  | jaipur   |
|  4   | Priya         |  18  | 78769876  | noida    |
|  5   | Monika        |  17  | 98769876  | delhi    |
|  1   | Ajay          |  17  | 98769857  | delhi    |
|  3   | sonal         |  18  | 94769857  | noida    |
|  6   | Tanya         |  16  |    NULL   | delhi    |
+------+---------------+------+-----------+----------+
8 rows in set (0.00 sec)

mysql> delete from student where ID=1 and Age!=18;
Query OK, 1 row affected (0.11 sec)

mysql> select * from student;
+------+---------------+------+-----------+----------+
| ID   | Student_Name  | Age  | Phone     | Address  |
+------+---------------+------+-----------+----------+
|  1   | Amit          |  18  | 98769876  | Sonipat  |
|  2   | Sonam         |  16  | 88769876  | gurugram |
|  3   | Mahesh        |  17  | 68769876  | jaipur   |
|  4   | Priya         |  18  | 78769876  | noida    |
|  5   | Monika        |  17  | 98769876  | delhi    |
|  3   | sonal         |  18  | 94769857  | noida    |
|  6   | Tanya         |  16  |    NULL   | delhi    |
+------+---------------+------+-----------+----------+
7 rows in set (0.00 sec)
```

Example 2: Let's delete all data of student table. For doing those, we needs to give a condition that matches with all the records. As ID's are greater than 0, so let's delete all those records where ID is greater than 0.

```
mysql> select * from student;
+------+---------------+------+----------+----------+
| ID   | Student_Name  | Age  | Phone    | Address  |
+------+---------------+------+----------+----------+
| 1    | Amit          | 18   | 98769876 | Sonipat  |
| 2    | Sonam         | 16   | 88769876 | gurugram |
| 3    | Mahesh        | 17   | 68769876 | jaipur   |
| 4    | Priya         | 18   | 78769876 | noida    |
| 5    | Monika        | 17   | 98769876 | delhi    |
| 3    | sonal         | 18   | 94769857 | noida    |
| 6    | Tanya         | 16   |     NULL | delhi    |
+------+---------------+------+----------+----------+
7 rows in set (0.00 sec)

mysql> delete from student where ID>0;
Query OK, 7 rows affected (0.11 sec)

mysql> select * from student;
Empty set (0.00 sec)
```

Aggregate Functions:

Aggregate functions are those functions that operates on a list of values and returns a single digit value or we can summarize the data using aggregate functions.

1. **Max()**:
   It is used to find out the maximum value from a column.

```
mysql> select * from student;
+------+---------------+------+----------+----------+
| ID   | Student_Name  | Age  | Phone    | Address  |
+------+---------------+------+----------+----------+
| 1    | Amit          | 18   | 98769876 | Sonipat  |
| 2    | Sonam         | 16   | 88769876 | Gurugram |
| 3    | Mahesh        | 17   | 68769876 | Jaipur   |
| 4    | Priya         | 18   | 78769876 | Noida    |
| 5    | Monika        | 17   | 98769876 | Delhi    |
| 6    | Raman         | 18   | 98765876 | Noida    |
| 7    | Pawan         | 19   | 28765876 | Delhi    |
+------+---------------+------+----------+----------+
7 rows in set (0.00 sec)

mysql> select max(ID) from student;
+---------+
| max(ID) |
+---------+
| 7       |
+---------+
1 row in set (0.09 sec)
```

2. **Min()**:
   It is used to find out the minimum value from a column.

```
mysql> select min(ID) from student;
+---------+
| min(ID) |
+---------+
| 1       |
+---------+
1 row in set (0.00 sec)
```

3. **Avg()**:
   It is used to find out the average value from a column.

```
mysql> select avg(Age) from student;
+----------+
| avg(Age) |
+----------+
|  17.5714 |
+----------+
1 row in set (0.05 sec)
```

4. **Sum()**:
   It is used to find out the sum of all values of a column.

```
mysql> select sum(Age) from student;
+----------+
| sum(Age) |
+----------+
|      123 |
+----------+
1 row in set (0.02 sec)
```

5. **Count**: it is used to count number of values in a column.

```
mysql> select count(ID) from student;
+-----------+
| count(ID) |
+-----------+
|         7 |
+-----------+
1 row in set (0.00 sec)
```

Note: Distinct keyword can be used with aggregate functions to find out max, min, sum, avg, count of only unique values.

Example: Let's find out total number of cities from where student came for study. Here more than one student is from same city. So we needs to use distinct keyword along with count function.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         |   18 | 98769876 | Sonipat  |
| 2  | Sonam        |   16 | 88769876 | Gurugram |
| 3  | Mahesh       |   17 | 68769876 | Jaipur   |
| 4  | Priya        |   18 | 78769876 | Noida    |
| 5  | Monika       |   17 | 98769876 | Delhi    |
| 6  | Raman        |   18 | 98765876 | Noida    |
| 7  | Pawan        |   19 | 28765876 | Delhi    |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)

mysql> select count(distinct(Address)) from student;
+--------------------------+
| count(distinct(Address)) |
+--------------------------+
|                        5 |
+--------------------------+
1 row in set (0.00 sec)
```

Group by clause:

The GROUP BY clause is used to group rows that have the same values into summary rows. Group by clause is often used with aggregate functions like MAX(), MIN(), SUM(), AVG() and COUNT() to group the result by one or more columns.

- It can be used with or without where clause in select statement.
- It is applied only on numeric values.
- It can't be applied with distinct keyword.

SQL Syntax:

group by <column name>

Example 1: Let's count number of students having same age in student table.

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
| 1  | Amit         |   18 | 98769876 | Sonipat  |
| 2  | Sonam        |   16 | 88769876 | Gurugram |
| 3  | Mahesh       |   17 | 68769876 | Jaipur   |
| 4  | Priya        |   18 | 78769876 | Noida    |
| 5  | Monika       |   17 | 98769876 | Delhi    |
| 6  | Raman        |   18 | 98765876 | Noida    |
| 7  | Pawan        |   19 | 28765876 | Delhi    |
+----+--------------+------+----------+----------+
7 rows in set (0.05 sec)
```

```
mysql> select Age,count(ID) as Students_Count from student group by Age;
+------+----------------+
| Age  | Students_Count |
+------+----------------+
|  16  |              1 |
|  17  |              2 |
|  18  |              3 |
|  19  |              1 |
+------+----------------+
4 rows in set (0.06 sec)
```

aliasing

Example 2: Let's city wise find out the minimum value of ID.

```
mysql> select Address, min(ID) from student group by Address;
+----------+---------+
| Address  | min(ID) |
+----------+---------+
| Delhi    | 5       |
| Gurugram | 2       |
| Jaipur   | 3       |
| Noida    | 4       |
| Sonipat  | 1       |
+----------+---------+
5 rows in set (0.00 sec)
```

Having clause:

It is used to filter the result set of group by clause in select statement.

Note: To filter the result set of group by clause, only having clause can be used whereas for all other queries where clause is used.

```
mysql> select count(ID) as No_of_student,Age from student group by Age having Age=18;
+---------------+-----+
| No_of_student | Age |
+---------------+-----+
|             3 |  18 |
+---------------+-----+
1 row in set (0.00 sec)
```

Joins:

Joins are used to combine rows from multiple tables.

Types of joins:

1. Cartesian product (Cross Join):

It gives all possible combinations from more than one table. It combines every row from one table with every row from another table. Suppose we have 5 rows in first table and 4 rows in second table then the total number of rows in Cartesian product of these two tables will be 20 rows.
Cardinality of final table of Cartesian product = cardinality of first table * cardinality of second table

Example: we have two tables' student and awards. Let's apply Cartesian product on these two tables.

```
mysql> select * from student,awards;
+----+--------------+-----+----------+----------+----+--------+
| ID | Student_Name | Age | Phone    | Address  | ID | award  |
+----+--------------+-----+----------+----------+----+--------+
|  1 | Amit         |  18 | 98769876 | Sonipat  |  1 | gold   |
|  1 | Amit         |  18 | 98769876 | Sonipat  |  2 | bronze |
|  1 | Amit         |  18 | 98769876 | Sonipat  |  2 | silver |
|  1 | Amit         |  18 | 98769876 | Sonipat  |  3 | bronze |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  1 | gold   |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  2 | bronze |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  2 | silver |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  3 | bronze |
|  3 | Mahesh       |  17 | 68769876 | Jaipur   |  1 | gold   |
|  3 | Mahesh       |  17 | 68769876 | Jaipur   |  2 | bronze |
|  3 | Mahesh       |  17 | 68769876 | Jaipur   |  2 | silver |
|  3 | Mahesh       |  17 | 68769876 | Jaipur   |  3 | bronze |
|  4 | Priya        |  18 | 78769876 | Noida    |  1 | gold   |
|  4 | Priya        |  18 | 78769876 | Noida    |  2 | bronze |
|  4 | Priya        |  18 | 78769876 | Noida    |  2 | silver |
|  4 | Priya        |  18 | 78769876 | Noida    |  3 | bronze |
|  5 | Monika       |  17 | 98769876 | Delhi    |  1 | gold   |
|  5 | Monika       |  17 | 98769876 | Delhi    |  2 | bronze |
|  5 | Monika       |  17 | 98769876 | Delhi    |  2 | silver |
|  5 | Monika       |  17 | 98769876 | Delhi    |  3 | bronze |
|  6 | Raman        |  18 | 98765876 | Noida    |  1 | gold   |
|  6 | Raman        |  18 | 98765876 | Noida    |  2 | bronze |
|  6 | Raman        |  18 | 98765876 | Noida    |  2 | silver |
|  6 | Raman        |  18 | 98765876 | Noida    |  3 | bronze |
|  7 | Pawan        |  19 | 28765876 | Delhi    |  1 | gold   |
|  7 | Pawan        |  19 | 28765876 | Delhi    |  2 | bronze |
|  7 | Pawan        |  19 | 28765876 | Delhi    |  2 | silver |
|  7 | Pawan        |  19 | 28765876 | Delhi    |  3 | bronze |
+----+--------------+-----+----------+----------+----+--------+
28 rows in set (0.05 sec)
```

2. Equi join:

It joins the tables based on one common column. However, final result will consists of common column from both the tables.

Example: we have two tables' student and awards. Let's apply equi join on these two tables.

```
mysql> select * from student,awards where student.ID=awards.ID;
+----+--------------+-----+----------+----------+----+--------+
| ID | Student_Name | Age | Phone    | Address  | ID | award  |
+----+--------------+-----+----------+----------+----+--------+
|  1 | Amit         |  18 | 98769876 | Sonipat  |  1 | gold   |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  2 | bronze |
|  2 | Sonam        |  16 | 88769876 | Gurugram |  2 | silver |
|  3 | Mahesh       |  17 | 68769876 | Jaipur   |  3 | bronze |
+----+--------------+-----+----------+----------+----+--------+
4 rows in set (0.06 sec)
```

Here both the tables has common column ID. So, to avoid ambiguity (confusion), we needs to mention table name before column name.

```
mysql> select ID,Student_Name from student,awards where student.ID=awards.ID;
ERROR 1052 (23000): Column 'ID' in field list is ambiguous
mysql>
mysql> select student.ID,Student_Name from student,awards where student.ID=awards.ID;
+----+--------------+
| ID | Student_Name |
+----+--------------+
|  1 | Amit         |
|  2 | Sonam        |
|  2 | Sonam        |
|  3 | Mahesh       |
+----+--------------+
4 rows in set (0.00 sec)
```

3. Natural Join:

It joins the tables based on one common column. However, final result will consists of common column only once.

Example: we have two tables' student and awards. Let's apply natural join on these two tables.

```
mysql> select * from student natural join awards;
+----+--------------+------+----------+----------+--------+
| ID | Student_Name | Age  | Phone    | Address  | award  |
+----+--------------+------+----------+----------+--------+
| 1  | Amit         |   18 | 98769876 | Sonipat  | gold   |
| 2  | Sonam        |   16 | 88769876 | Gurugram | bronze |
| 2  | Sonam        |   16 | 88769876 | Gurugram | silver |
| 3  | Mahesh       |   17 | 68769876 | Jaipur   | bronze |
+----+--------------+------+----------+----------+--------+
4 rows in set (0.00 sec)
```

Here both the tables has common column ID. But there is no ambiguity arises on name of common column.

```
mysql> select ID,Student_Name from student natural join awards;
+----+--------------+
| ID | Student_Name |
+----+--------------+
| 1  | Amit         |
| 2  | Sonam        |
| 2  | Sonam        |
| 3  | Mahesh       |
+----+--------------+
4 rows in set (0.00 sec)
```

Python and MySQL Interface

In real life scenario, user interact with applications whereas data is stored in database. We have already developed python applications and database tables. Now, we will connect python application and MySQL database.

Steps for creating python and MySQL connectivity application:

1. Import mysql.connector
2. Create a connection
   <connection object> =mysql.connector.connect (host="localhost", user=<username>, passwd= <password>, database =<database name>)
   Username = To know the user name, run select user(); command on your MySQL.

```
mysql> select user();
+-----------------+
| user()          |
+-----------------+
| ODBC@localhost  |
+-----------------+
1 row in set (0.00 sec)
```

Password: It should be same as we set during MySQL installation.

Example: Let's create a connection of python with MySQL and test it.

Python Code:
```python
import mysql.connector
con=mysql.connector.connect(host="localhost",user="ODBC@localhost",database="test")
if con.is_connected():
    print("Connection Success")
else:
    print("Connection Failure")
```

Output:
```
=======================
Connection Success
>>>
```

Here in above example, I had not set any database password, so, passwd option is not mentioned in connection string. Is_connected() function checks whether connection string is able to connect python with MySQL. If connection string is able to make connect python and MySQL, is_connected() returns True otherwise False.

3. Create a cursor

   Cursor: It is a pointer or iterator which points towards the resultset of the SQL query. Whenever a SQL query runs, It give the entire result set in one go. We may not require the entire resultset at once. So, a cursor is created and data from the entire resultset will be fetched row by row as per our requirement.
   Syntax: <cursor object> = <connection object>.cursor()

4. Execute query

   Syntax: <cursor object> . execute(<SQL query string>)

5. Extract data from result set

   As we know that, Data from database is retrieved using select query. After running the select query, we get the resultset. Now to fetch the data from resultset, following functions are used:

   a) **fetchall():** It returns all the records from resultset. Each individual record will be in the form of a tuple whereas the entire resultset will be in the form of a list.
   Syntax: <variable name>=<cursor>.fetchall()

```
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
a="select * from student" #SQL query
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
c=cur.fetchall() #retrieving the entire dataset from cursor using fetchall()
print(c) #priting the fetched dataset
con.close() #closing the connection
===================== RESTART: C:/Users/SNY/connec.py =====================
[('1', 'Amit', 18, 98769876, 'Sonipat'), ('2', 'Sonam', 16, 88769876, 'Gurugram'
), ('3', 'Mahesh', 17, 68769876, 'Jaipur'), ('4', 'Priya', 18, 78769876, 'Noida'
), ('5', 'Monika', 17, 98769876, 'Delhi'), ('6', 'Raman', 18, 98765876, 'Noida')
, ('7', 'Pawan', 19, 28765876, 'Delhi')]
>>> |
```

b) **fetchone():**It returns one row from resultset in the form of a tuple. It returns None, if no more records are there. To get multiple rows, we needs to run fetchone() multiple times.

Syntax: <variable name>=<cursor>.fetchone()

```
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
a="select * from student" #SQL query
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
c=cur.fetchone() #retrieving the one record using fetchone()
print(c) #priting the fetched dataset
con.close() #closing the connection

===================== RESTART: C:/Users/SNY/connec.py =====================
('1', 'Amit', 18, 98769876, 'Sonipat')
>>> |
```

c) **fetchmany():**It returns n number of records from resultset in the form of a list where each individual record is in the form of a tuple. It returns empty tuple, if no more records are there.

Syntax: <variable name>=<cursor>.fetchmany(n)

Python Code:

```
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
a="select * from student" #SQL query
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
c=cur.fetchmany(5) #retrieving the five records using fetchmany()
d=cur.rowcount #to count the number of rows in resultset
print(c) #priting the fetched dataset
print("Number of rows in resultset is = ",d)
con.close() #closing the connection
```

Output :

```
===================== RESTART: C:/Users/SNY/connec.py =====================
[('1', 'Amit', 18, 98769876, 'Sonipat'), ('2', 'Sonam', 16, 88769876, 'Gurugram'
), ('3', 'Mahesh', 17, 68769876, 'Jaipur'), ('4', 'Priya', 18, 78769876, 'Noida'
), ('5', 'Monika', 17, 98769876, 'Delhi')]
Number of rows in resultset is =  5
```

d) **rowcount:** It is cursor's property to count the number of rows in resultset.
Syntax: <variable name>=<cursor>.rowcount
Example: Refer to the example of fetchmany()

6. Close the connection
After doing all the processing, connection should be closed.
Syntax: <connection object>.close()
Example: Refer to the example of fetchmany()

Format specifier:

We need format specifier to write SQL query based on user input. For doing this we have two ways:

1. **Using % formatting:**
Whenever we needs to complete SQL query based on user input, we write a placeholder %s on that place.
Example: Let's fetch all the data from student table where age is 'x' and city is 'y'. (Here, value of x and y will be given by the user during run time).

Python Code:

```python
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
x=int(input("Enter Student's Age = "))
y=input("Enter Student's City = ")
a="select * from student where Age=%s and Address = '%s'"%(x,y)
#SQL Query using % formatting where age and address is given by user
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
c=cur.fetchall() #retrieving all records using fetchall()
print(c) #priting the fetched dataset
con.close() #closing the connection
```

Output:

```
===================== RESTART: C:/Users/SNY/connec.py =====================
Enter Student's Age = 18
Enter Student's City = Sonipat
[('1', 'Amit', 18, 98769876, 'Sonipat')]
>>>
```

2. **Using format() function:**
Whenever we needs to complete SQL query based on user input, we write a placeholder {} on that place. If we needs to complete the SQL query based on multiple user input, we

write placeholder {}, {}, {} and so on at those places and pass user defined values in format function in sequence. Here 1st values passed in format function will be passed to 1st {}, 2nd values passed to 2nd {}, 3rd value passed to 3rd {} and so on.

Example: Let's fetch all the data from student table where age is 'x' and city is 'y'. (Here, value of x and y will be given by the user during run time).

Python Code:

```python
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
x=int(input("Enter Student's Age = "))
y=input("Enter Student's City = ")
a="select * from student where Age={} and Address='{}'".format(x,y)
#SQL Query using format() function where age and address is given by user
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
c=cur.fetchall() #retrieving all records using fetchall()
print(c) #priting the fetched dataset
con.close() #closing the connection
```

Output:

```
Enter Student's Age = 18
Enter Student's City = Sonipat
[('1', 'Amit', 18, 98769876, 'Sonipat')]
>>>
```

Commit() : Whenever we perform update, delete or insert query, commit() function must be run before closing the connection.

Syntax: <connection object>.commit()

Example 1: Insert data in student table which will be given by the user during run time.

Data in student table before insertion

```
mysql> select * from student;
+----+--------------+------+----------+----------+
| ID | Student_Name | Age  | Phone    | Address  |
+----+--------------+------+----------+----------+
|  1 | Amit         |   18 | 98769876 | Sonipat  |
|  2 | Sonam        |   16 | 88769876 | Gurugram |
|  3 | Mahesh       |   17 | 68769876 | Jaipur   |
|  4 | Priya        |   18 | 78769876 | Noida    |
|  5 | Monika       |   17 | 98769876 | Delhi    |
|  6 | Raman        |   18 | 98765876 | Noida    |
|  7 | Pawan        |   19 | 28765876 | Delhi    |
+----+--------------+------+----------+----------+
7 rows in set (0.00 sec)
```

Python code:

```
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
v=input("Enter Student's ID = ")
w=input("Enter Student's Name = ")
x=int(input("Enter Student's Age = "))
y=int(input("Enter Student's Phone = "))
z=input("Enter Student's City = ")
a="insert into student values('{}','{}',{},{},'{}')".format(v,w,x,y,z)
#SQL Query to insert data using format() function where data is given by user
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
con.commit() #commiting the changes in the database
print("Data inserted successfully") #printing confirmation message
con.close() #closing the connection
```

Output:

```
===================== RESTART: C:\Users\SNY\connec.py =====================
Enter Student's ID = 10
Enter Student's Name = Shaan
Enter Student's Age = 16
Enter Student's Phone = 987444
Enter Student's City = Faridabad
Data inserted successfully
>>>
```

Data in student table after insertion

Example 2: Delete data of those students whose ID is given by the user during run time in student table.

In the previous example, after inserting a record in student table, we have 8 records in the student table. (Kindly refer previous example for current state of student table).

Python code:

```
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
x=input("Enter Student's ID = ")
a="delete from student where ID={}".format(x)
#SQL Query to delete data using format() function where ID is given by user
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
con.commit() #commiting the changes in the database
print("Data deleted successfully") #printing confirmation message
con.close() #closing the connection
```

Output:

```
>>>
==================== RESTART: C:/Users/SNY/delete.py ====================
Enter Student's ID = 1
Data deleted successfully
>>>
```

Data in student table after deletion

```
mysql> select * from student;
+-----+--------------+------+----------+-----------+
| ID  | Student_Name | Age  | Phone    | Address   |
+-----+--------------+------+----------+-----------+
|  2  | Sonam        |   16 | 88769876 | Gurugram  |
|  3  | Mahesh       |   17 | 68769876 | Jaipur    |
|  4  | Priya        |   18 | 78769876 | Noida     |
|  5  | Monika       |   17 | 98769876 | Delhi     |
|  6  | Raman        |   18 | 98765876 | Noida     |
|  7  | Pawan        |   19 | 28765876 | Delhi     |
| 10  | Shaan        |   16 |   987444 | Faridabad |
+-----+--------------+------+----------+-----------+
7 rows in set (0.00 sec)
```

Example 3: Update name of those students whose name and ID is given by the user during run time in student table.

In the previous example, after deleting a record in student table, we have 7 records in the student table. (Kindly refer previous example for current state of student table).

Python code:

```python
import mysql.connector as mys #mys is alias of mysql.connector
con=mys.connect(host="localhost",user="ODBClocalhost",database="test")
cur=con.cursor() #creating cursor
x=input("Enter Student's ID = ")
y=input("Enter Student's Name = ")
a="update student set Student_Name='{}' where ID='{}'".format(y,x)
#SQL Query to update student's name using format() function
#where ID is given by user
b=cur.execute(a) #executing SQL query 'a' with cursor 'cur'
con.commit() #commiting the changes in the database
print("Data updated successfully") #printing confirmation message
con.close() #closing the connection
```

Output:

```
==================== RESTART: C:/Users/SNY/update.py ====================
Enter Student's ID = 5
Enter Student's Name = Moana
Data updated successfully
>>>
```

Data in student table after updating

```
mysql> select * from student;
+----+--------------+------+----------+-----------+
| ID | Student_Name | Age  | Phone    | Address   |
+----+--------------+------+----------+-----------+
|  2 | Sonam        |   16 | 88769876 | Gurugram  |
|  3 | Mahesh       |   17 | 68769876 | Jaipur    |
|  4 | Priya        |   18 | 78769876 | Noida     |
|  5 | Moana        |   17 | 98769876 | Delhi     |
|  6 | Raman        |   18 | 98765876 | Noida     |
|  7 | Pawan        |   19 | 28765876 | Delhi     |
| 10 | Shaan        |   16 |   987444 | Faridabad |
+----+--------------+------+----------+-----------+
7 rows in set (0.00 sec)
```

MULTIPLE CHOICE QUESTIONS (MCQ)

1. What is the use of DBMS?
    a. Data Retrieval
    b. Data Storage
    c. Data Manipulation
    d. All of the above

2. What is relational data model?
    a. Where data is organized in tree like structure with parent child relationship
    b. Where pointer is used to navigate through data
    c. Where data is represented as objects.
    d. Where data is organized into tables with rows and columns

3. What is tuple is relation?
    a. row
    b. column
    c. field
    d. attribute

4. What is attribute in relation?
    a. row
    b. column
    c. tuple
    d. key

5. What is degree in database?
    a. Foreign key of the table
    b. Primary key of the table
    c. Number of columns in the table
    d. Number of rows in the table

6. What is domain in database?
    a. The alternate key of a table
    b. The primary key of a table
    c. The set of all possible values in column
    d. The number of rows in table

7. What is cardinality in database?
    a. Number of columns
    b. Number of rows
    c. Number of primary key
    d. Number of attribute key

8. What is key in SQL?
   a. Which is used to uniquely identify record
   b. To maintain data integrity
   c. To enable efficient data retrieval
   d. All of the above

9. Which key is used to uniquely identify record in table and doesn't allow NULL values?
   a. Alternate key
   b. Primary key
   c. Super key
   d. Foreign key

10. A column that could potentially be used as the primary key and it should also contain unique values?
    a. Alternate key
    b. Primary key
    c. Candidate key
    d. Surrogate key

11. A candidate key that is not selected as primary key which can serve as a unique identifier.
    a. Alternate key
    b. Primary key
    c. Candidate key
    d. Surrogate key

12. What is the use of foreign key?
    a. To uniquely identify record
    b. To enforce data integrity
    c. To define the data type of column
    d. To establish a link between two tables

13. A column or set of column in table that refers to the primary key of another table.
    a. Alternate key
    b. Primary key
    c. Candidate key
    d. Foreign key

14. Which of the following SQL commands is used to view list of all database?
    a. select databases
    b. show databases
    c. view databases
    d. project databases

15. Which of the following SQL commands is used to use/select a particular database?

a. use
b. select
c. view
d. project

16. Which SQL command is used to define and maintain physical structure or schema of table in database like creating, altering and deleting database object such as table and constraints?
a. DDL
b. DML
c. DCL
d. TCL

17. Which SQL command used to change or modify any attribute/column like addition and deletion of column in database?
a. create
b. alter
c. delete
d. update

18. A user request to retrieve data or information from database/table is called?
a. key
b. data
c. query
d. view

19. Which of the following is not a valid datatype in SQL?
a. Date
b. String
c. Decimal
d. Char

20. Which command is used to delete database permanently?
a. create database
b. delete database
c. drop database
d. use database

21. Which commands is used to show all table in current using database?
a. display tables;
b. show tables;
c. view tables;
d. select all tables;

22. Which command is used in where clause to search NULL values in a particular column?

   a. IS NULL

   b. IN NULL

   c. NOT NULL

   d. IS NOT NULL

23. Wild card operator (%,_) are used with?

   a. count

   b. max

   c. like

   d. min

24. Which SQL function is used to determine the no. of row or non-null values?

   a. min

   b. max

   c. count

   d. sum

25. Which SQL function is used to count the entire number of row in database table?

   a. count

   b. count(*)

   c. max

   d. min

26. In relational database, a key that established a link between two tables?

   a. Primary key

   b. Alternate key

   c. Foreign key

   d. Candidate key

27. A table containing data organized in the form of row and column in relational data model?

   a. Relation

   b. View

   c. Tuple

   d. Database

28. Which SQL clause is used to filter the result of SELECT statement in Relational Database?

   a. from

   b. where

   c. join

   d. having

29. INSERT command is used in database to perform

a. To retrieve a set of statement
b. To add new row of data to a table
c. To change already existing data in table
d. To delete any existing row in table

30. How many candidate key can a relation/table have in relational database
a. One
b. Two
c. Multiple
d. None

31. What is the main difference between candidate key and primary key?
a. A candidate key can contain NULL value but primary key can't contain NULL value
b. A primary key can contain unique value but it is not necessary for the candidate key to have unique value
c. Candidate key is chosen by database system while primary key is chosen by the designer
d. No difference

32. Which DDL command is used to modify the structure of an existing table?
a. create table
b. modify table
c. alter table
d. update table

33. Which DDL command is used to remove a table along with its all content from a database?
a. DELETE TABLE
b. DROP TABLE
c. REMOVE TABLE
d. ERASE TABLE

34. Which constraint enforce data integrity by ensuring that a column always contain a values?
a. NULL
b. NOT NULL
c. CHECK
d. DEFAULT

35. What is primary difference between candidate key and primary key in database?
a. Primary key is chosen by the end user/designer while candidate key is generated by database system
b. A candidate key uniquely identifies each row in a table, while primary key is not unique
c. A primary key can have NULL values while a candidate key can't

d. A candidate key can become a primary key, but a primary key can't become a candidate key

36. Which key is used to enforce referential integrity between tables in database system
   a. Primary key
   b. Candidate key
   c. Foreign key
   d. Alternate key

37. What is the main difference between CHAR and VARCHAR datatype in SQL?
   a. CHAR is case-sensitive while VARCHAR is non case sensitive
   b. CHAR store variable length strings while VARCHAR stores fixed length string
   c. CHAR store fixed length strings while VARCHAR stores variable length string
   d. CHAR is used storing numeric data while VARCHAR is used for text data

38. What is the primary purpose of unique key constraints in a relational databases?
   a. To ensure that values in a column are NULL
   b. To ensure that values in a column are unique
   c. To define relationship between tables
   d. To specify a condition that must be met for data to be valid in a column

39. Which constraint key is used when you want to enforce uniqueness but allows NULL values in database
   a. PRIMARY KEY
   b. UNIQUE KEY
   c. NOT NULL
   d. CHECK

40. Which of the following is not a valid DML command in SQL?
   a. INSERT
   b. UPDATE
   c. ALTER
   d. DELETE

41. Which keyword is used for table aliasing that involves giving a table short and alternative name to simplify query syntax?
   a. from
   b. as
   c. where
   d. on

42. Which SQL clause is used in database table to eliminate duplicate rows from the query result?
   a. group by

b. distinct

c. describe

d. duplicate

43. Which of the following clauses in SQL is most appropriate to use to select matching tuples in a specific range of values?

a. IN

b. LIKE

c. BETWEEN

d. IS

44. Which of the following SQL datatype allows NULL values by default?

a. INT

b. CHAR

c. VARCHAR

d. FLOAT

45. Which of the following is NOT a required argument to the connect() function?

a. Hostname

b. Username

c. Password

d. Database name

46. Which method is used to execute a SQL query on a MySQL database?

a. execute()

b. query()

c. run()

d. None of the above

47. Which method is used to fetch n number of results from a SQL query?

a. fetchall()

b. fetchone()

c. fetchmany()

d. All of the above

48. _____ it is a pointer or iterator which points towards the resultset of the SQL query.

a. cursor

b. rset

c. temp

d. None of these

49. Which of the following is not a valid method to fetch records from database in python.

a. fetchmany()

b. fetchone()

    c.   fetchmulti()

    d.   fetchall()

50. To get all the records from result set, you may use _____.

    a.   cursor.fetchmany()

    b.   cursor.fetchall()

    c.   cursor.fetchone()

    d.   cursor.execute()

Short answer type Questions:

1. What is SQL?
2. Differentiate between DML and DDL. Explain with the help of examples.
3. What are the different type of SQL data type?
4. What is the difference between where statement and having statement in SQL?
5. What is primary key?
6. Differentiate between a database table and a database record.
7. What is foreign Key? And how does it relate in a database.
8. What is Domain in database?
9. Explain the role of clause in query of SQL commands.
10. What is Aliasing?
11. Explain char, varchar and int datatype in SQL with example.
12. Differentiate between candidate key and alternate key?
13. Differentiate between degree and cardinality of a table with the help of example.
14. What are database keys? Explain all the database keys.
15. What are constraints in SQL?
16. Explain the wildcards used with like operator.
17. What are joins in SQL?
18. Differentiate between Natural Join and Equi Join.
19. Explain any two aggregate function in SQL.
20. What is a cursor?
21. What is the role of commit() function in SQL?
22. What is Cartesian product? What will be the number of rows in output table if we apply Cartesian product on two tables T1 and T2 with 9 and 10 rows respectively?
23. Explain alter table command with the help of example.
24. Differentiate between fetchall() function and fetchmany() function in SQL.
25. In SQL, Define aggregate function and write the name of the aggregate function which will display the cardinality of a table.

Assertion-and-Reason Type
In the following questions, Assertion (A) and Reason (R).
Choose the correct choice as:
(a) Both Assertion (A) and Reason (R) are the true and Reason (R) is a correct explanation of Assertion (A).
(b) Both Assertion (A) and Reason (R) are the true but Reason (R) is not a correct explanation of Assertion (A).
(c) Assertion (A) is true and Reason (R) is false.
(d) Assertion (A) is false and Reason (R) is true.

1. **Assertion (A):** COUNT function can be work with distinct keyword.
   Reason   (R): DISTINCT keyword can only be used with COUNT function.

2. **Assertion (A):** HAVING clause can only be used with GROUP BY statement.
   Reason   (R): WHERE clause can be used in place of HAVING clause in GROUP BY statement.

3. **Assertion (A):** LIKE operator is used for pattern matching in WHERE clause.
   Reason   (R): % and _ wildcard is used in LIKE operator for making a pattern.

4. **Assertion (A):** The primary key is applied on a column of a table.
   Reason   (R): NOT NULL constraint restricts NULL values in a column.

5. **Assertion (A):** SUM and COUNT are aggregate functions.
   Reason   (R): Aggregate functions works on multiple tuples.

6. **Assertion (A):** Primary key constraints allows NULL values.
   Reason   (R): The primary key constraints ensures that a column can contain unique Values for each row.

7. **Assertion (A):** Unique key constraint allows NULL values.
   Reason   (R): The unique key constraints ensures that a column can contain unique Values.

8. **Assertion (A):** The HAVING clause is used to filter aggregated data in SQL queries.
   Reason   (R): The HAVING clause is used to group rows with similar values in one or more column into result sets.

9. **Assertion (A):** Inner Join retrieves rows that have matching values in both tables being joined.
   Reason   (R): Inner join excludes row with no matching values

10. **Assertion (A):** Between operator is used to filter data within a specified range.
    Reason   (R): Where clause works exactly same as between operator

Long Answer Type Questions:

1. Write MySQL command to create the table 'Employee' with the following structure and constraint. Table: Employee

Column_Name	DataType(size)	Constraint
Emp_ID	Int(20)	Primary key
Emp_Name	char(100)	Not Null
Salary	int(20)	Not Null
Department	char(30)	
Age	int(15)	Not Null
Address	Varchar(200)	Unique

2. Write MySQL command to create the table 'Student' and 'Activities' with the following structure and constraint.
   Table: Student

Column_Name	DataType(size)	Constraint
Student_ID	varchar(20)	Primary key
Student_Name	char(80)	Not Null
Gender	char(20)	Not Null
Class	varchar(30)	
Age	int(20)	Not Null
Address	Varchar(150)	Unique
Phone	Int(15)	Not Null, unique

   Table: Activities

Column_Name	DataType(size)	Constraint
Student_ID	varchar(20)	Foreign key references to Student_ID of Employee table
Activity_Name	char(80)	Not Null
Position	char(30)	Not Null

3. Anmol maintain that database of medicines for his pharmacy using SQL to store the data. The structure of the table PHARMA for the purpose is as follows:

   - Name of the table-PHARMA
   - The attributes of PHARMA are as follows:

         MID - numeric
         MNAME - character of size 20
         PRICE - numeric
         UNITS - numeric
         EXPIRY – date

Table: PHARMA

MID	MNAME	PRICE	UNITS	EXPIRY
M1	PARACETAMOL	12	120	2022-12-25
M2	CETRIZINE	6	125	2022-10-12
M3	METFORMIN	14	150	2022-05-23
M4	VITAMIN B-6	12	120	2022-07-01
M5	VITAMIN D3	25	150	2022-06-30
M6	TELMISARTAN	22	115	2022-02-25

(a) Write the degree and cardinality of the table PHARMA.

(b) Identify the attribute best suitable to be declared as a primary key.

(c) Anmol has received a new medicine to be added into his stock, but for which he does not know the number of UNITS. So he decides to add the medicine without its value for UNITS. The rest of the values are as follows:

MID	MNAME	PRICE	EXPIRY
M7	SUCRALFATE	17	2022-03-20

Write the SQL command which Anmol should execute to perform the required task.

(d) Anmol wants to change the name of the attribute UNITS to QUANTITY in the table PHARMA. Which of the following commands will he use for the purpose?

   I.   UPDATE
   II. DROP TABLE
   III. CREATE TABLE
   IV. ALTER TABLE

(e) Now Anmol wants to increase the PRICE of all medicines following commands will he use for the purpose?

   I.   UPDATE SET
   II. INCREASE BY
   III. ALTER TABLE
   IV. INSERT INTO

4. For the following SQL Table named PASSENGERS in a database TRAVEL:

TNO	NAME	START	END
T1	RAVI KUMAR	DELHI	MUMBAI
T2	NISHANT JAIN	DELHI	KOLKATA
T3	DEEPAK PRAKASH	MUMBAI	PUNE

A cursor named Cur is created in Python for a connection of a host which contains the database TRAVEL. Write the output for the execution of the following Python statements

for the above SQL Table PASSENGERS:
Cur.execute('USE TRAVEL')
Cur.execute('SELECT * FROM PASSENGERS')
Recs=Cur.fetchall()
For R in Recs:
    Print(R[1])

5. Write SQL statements for the following queries (i) to (v) based on the relations CUSTOMER and TRANSACTION given below:

Table: CUSTOMER

ACNO	NAME	GENDER	BALANCE
C1	RISHABH	M	15000
C2	AAKASH	M	12500
C3	INDIRA	F	9750
C4	TUSHAR	M	14600
C5	ANKITA	F	22000

Table: TRANSACTION

ACNO	TDATE	AMOUNT	TYPE
C1	2020-07-21	1000	DEBIT
C5	2019-12-31	1500	CREDIT
C3	2020-01-01	2000	CREDIT

1. To display all information about the CUSTOMERS whose NAME starts with 'A'.
2. To display the NAME and BALANCE of Female CUSTOMERS (with GENDER as 'F') whose TRANSACTION Date (TDATE) is in the year 2019.
3. To display the total number of CUSTOMERS for each GENDER.
4. To display the CUSTOMER NAME and BALANCE in ascending order of GENDER.
5. To display CUSTOMER NAME and their respective INTEREST for all CUSTOMERS where INTEREST is calculated as 8% of BALANCE.

6. The IT Company XYZ has asked their IT manager Ms. Preeti to maintain the data of all the employees in two tables EMPLOYEE and DEPT. Ms. Preeti has created two tables EMPLOYEE and DEPT. She entered 6 rows in EMPLOYEE table and 5 rows in DEPT table.

Table: DEPT

D_CODE	D_NAME	CITY
D001	INFRASTRUCTURE	DELHI
D002	MARKETING	DELHI
D003	MEDIA	MUMBAI
D005	FINANCE	KOLKATA
D004	HUMAN RESOURCE	MUMBAI

Table: EMPLOYEE

E_NO	NAME	DOJ	DOB	GENDER	D_CODE	Salary
1001	Vinay	2013-09-02	1991-09-01	MALE	D001	250000
1002	Ruby	2012-12-11	1990-12-15	FEMALE	D003	270000
1003	Anuj	2013-02-03	1987-09-04	MALE	D005	240000
1007	Sunny	2014-01-17	1988-10-19	MALE	D004	250000
1004	Rohit	2012-12-09	1986-11-14	MALE	D001	270000
1005	Preeti	2013-11-18	1989-03-31	FEMALE	D002	NULL

Note: DOJ refers to date of joining and DOB refers to date of Birth of employees.

Based on the above data, answer the following questions:
1. Identify the column which can be consider as primary key in EMPLOYEE table.
2. **Identify the column which can be consider as primary key in DEPT table**
3. What is the degree and cardinality of EMPLOYEE table?
4. What is the degree and cardinality of DEPT table?
5. **Write SQL queries for the following:**
   1) Insert two new row in Employee table with following data:

1006	Rahul	2019-11-06	1992-01-04	MALE	D003	156000
1008	Sonam	2022-01-06	1991-04-06	FEMALE	D005	167000

   2) To display E_NO, NAME, GENDER from the table EMPLOYEE in descending order of E_NO.
   3) To display the NAME of all the 'FEMALE' employees from the table EMPLOYEE.
   4) To display the E_NO and NAME of those employees from the table EMPLOYEE who are born between '1987-01-01' and '1991-12-01'.
   5) To display NAME and CITY of those employees whose DEPARTMENT is either 'MEDIA' or 'FINANCE'.
   6) To display the NAME of those employees whose name starts with letter 'R'.
   7) To display NAME of those employees whose name contains letter 'n'.
   8) To display NAME of those employees whose name has exact 5 letters.
   9) To display D_NAME and CITY from table DEPT where D_NAME ends with letter 'G' and CITY is 'DELHI'.
   10) To display the maximum SALARY of EMPLOYEE table.
   11) To delete data of all those employees whose age is less than 25.
   12) To update SALARY to 230000 of those employee whose E_NO is 1004.
   13) To change the sequence of DOB column in employee table and move it before DOJ column.
   14) To add a new column MOBILE int(20) before column SALARY in employee table.
   15) To set SALARY to 300000 of all those employees whose age is NULL.
   16) To Increase the salary of all employees by 30000 in EMPLOYEE table.
   17) To display the average SALARY of EMPLOYEE table.
   18) To display name of employees who have SALARY more than 200000 in ascending order of NAME.
   19) To display department wise average salary of employees.
   20) To display total number of departments in XYZ company.
   21) To delete data of all the employees whose D_CODE is not 'D001'.
   22) To display E_NO, NAME and SALARY of all those employees who don't live in 'DELHI'.

23) To change column name CITY to D_CITY in DEPT table.
24) To delete EMPLOYEE table.
25) To delete D_NAME column from DEPT table.

7. A garment store is considering to maintain their inventory using SQL to store the data. as a database administrator, Mr.Rohit has decided that:
   - Name of the database – **STORE**
   - Name of the table – **GARMENT**
   - The attributes of GARMENT table are as follows:
     - **GCODE** – numeric
     - **DESCRIPTION** – character of size 50
     - **PRICE** – numeric
     - **FCODE** – varchar of size 10

   Table: GARMENT

GCODE	DESCRIPTION	PRICE	FCODE
10023	JEANS	1150	F01
10001	SHIRT	750	F02
10044	SHORTS	600	F05
10005	TIE	400	F04
10002	JACKET	5000	F01
10022	SOCKS	150	NULL

1. Categorize the following commands as DDL or DML:
   ALTER, INSERT, UPDATE, CREATE, DROP, DELETE
2. Identify the attribute of Garment table to be declared as primary key.
3. Write the degree and cardinality of the table GARMENT
4. Write SQL query to create database STORE.
5. Write SQL query to display list of available databases.
6. Write SQL query to use database STORE.
7. Write SQL query to display list of available tables in database STORE.
8. Write SQL query to create table GARMENT with aforementioned attributes.
9. Obtain the output of following SQL queries based on the data given in table GARMENT:
   (i) SELECT MAX(PRICE), MIN(PRICE) FROM GARMENT;
   (ii) SELECT GCODE, DESCRIPTION FROM GARMENT;
   (iii) SELECT FCODE,GCODE FROM GARMENT WHERE PRICE BETWEEN 500 AND 800;
   (iv) SELECT * FROM GARMENT WHERE DESCRIPTION NOT IN ('JEANS','TIE');
   (v) SELECT GCODE FROM GARMENT WHERE DESCRIPTION LIKE '%S%';
   (vi) SELECT GCODE,PRICE FROM GARMENT WHERE DESCRIPTION LIKE '_ _ _';
   (vii) SELECT DISTINCT FCODE FROM GARMENT;

(viii)   SELECT SUM(PRICE) FROM GARMENT;
(ix)   SELECT * FROM GARMENT WHERE DESCRIPTION LIKE '%T%' AND FCODE!='F02';
(x)   SELECT * FROM GARMENT ORDER BY PRICE DESC;
(xi)   SELECT PRICE*10 FROM GARMENT;
(xii)   SELECT COUNT(DISTINCT FCODE) FROM GARMENT;
(xiii)   SELECT * FROM GARMENT WHERE FCODE NOT IN ('F01','F02') AND PRICE<500;
(xiv)   SELECT GCODE, PRICE FROM GARMENT WHERE FCODE IS NULL;
(xv)   SELECT * FROM GARMENT WHERE PRICE >500 AND PRICE <1000;

8. Write the output of the following SQL queries based on table TRANSACTION given below:

Table: TRANSACTION

T_NO	M_NO	AMOUNT	CARD_TYPE	DATE	STATUS
1	11	5000	CREDIT	2019-10-11	SUCCESS
2	11	170	CREDIT	2019-10-14	FAILURE
3	13	800	DEBIT	201-10-24	FAILURE
4	12	90	CREDIT	2019-11-10	SUCCESS
5	13	1400	DEBIT	2019-11-11	SUCCESS
6	11	500	DEBIT	2019-11-18	SUCCESS
7	13	1600	DEBIT	2019-11-27	FAILURE

Table: COMPANY

T_NO	QTY_ISSUED	COMPANY
1	15	SBI
3	50	ICICI
4	34	HDFC

(i)   SELECT M_NO, MIN(AMOUNT) FROM TRANSACTION GROUP BY M_NO HAVING COUNT(*)>2;
(ii)   SELECT T_NO,AMOUNT FROM TRANSACTION WHERE CARD_TYPE='CREDIT';
(iii)   SELECT * FROM TRANSACTION WHERE M_NO>12 AND STATUS='FAILURE';
(iv)   SELECT CARD_TYPE, SUM(AMOUNT) FROM TRANSACTION GROUP BY CARD_TYPE;
(v)   SELECT T_NO, AMOUNT*10 AS PAYMENT FROM TRANSACTION WHERE STATUS IN ('SUCCESS');
(vi)   SELECT COUNT(*) FROM TRANSACTION WHERE STATUS='SUCCESS';
(vii)   SELECT T_NO, AMOUNT, CARD_TYPE FROM TRANSACTION WHERE T_NO>5;
(viii)   SELECT DISTINCT M_NO FROM TRANSACTION;
(ix)   SELECT T_NO, M_NO,CARD_TYPE, COMPANY FROM TRANSACTION T, COMPANY C WHERE T.T_NO=C.T_NO AND AMOUNT>1000;
(x)   SELECT T.T_NO AS TRANS_NO FROM TRANSACTION T, COMPANY C WHERE T.T_NO=C.T_NO;

9. The code given below reads the records from the table employee and displays only those records of employee table who don't lives in city 'Delhi':

E_ID   – varchar(50)

E_Name – char(50)

Salary   – int(15)

City   – char(20)

Note the following to establish connectivity between Python and MySQL:
➢ **Username** is root
➢ **Password** is 12345
➢ The table exists in a MySQL database named *company*.
➢ The table has four attributes (E_ID, E_Name, Salary, City).

Write the following statements to complete the code:
Statement 1- to import the desired library.
Statement 2- to create a cursor
Statement 3- to write a sql query that fetches records of all those employees who don't lives in delhi.
Statement 4- to execute the query
Statement 5- to print all the records fetched in statement 4

```
Import _____ as mysql                          #Statement 1
def print():
    a=mysql.connect  (host="localhost",   user   "root",passwd=12345,   database=
    "company")
    b=_____                                  #Statement 2
    query = _____                        #Statement 3
    c = _____                          #Statement 4
    for z in c:
        _____                                   #Statement 5
```

10. The code given below deletes the records from the table employee which contains following record structure:

E_ID   – varchar(50)

E_Name – char(50)

Salary   – int(15)

City   – char(20)

Note the following to establish connectivity between Python and MySQL:
➢ **Username** is root
➢ **Password** is 12345
➢ The table exists in a MySQL database named *company*.
➢ The table has four attributes (E_ID, E_Name, Salary, City).

Write the following statements to complete the code:
Statement 1- to import the desired library.
Statement 2- to connect to the database

Statement 3- to create a cursor
Statement 4- to write a query that deletes the record with E_ID='A101' and E_Name starts with letter 'D'.
Statement 5- to remove the record permanently from the database.

```
Import _____ as mysql                          #Statement 1
def del():
    a=_____ (host="localhost", user "root",passwd=12345, database= "company")
                                                    #Statement 2
    b=_____                                   #Statement 3
    query = _____                        #Statement 4
    _____                              #Statement 5
    print('Data deleted')
```

11. Write a python program to delete all the tuples from Student table whose age>14.
    Note the following to establish connectivity between Python and MySQL:
    Username is root
    Password is 12345
    The table exists in a MySQL database named *school*.
    The table has five attributes (Stu_ID, Stu_Name, age, Address)

12. Write a python program to insert 5 records in Employee table. Take these 5 records as an input from the user (One record at a time).
    Note the following to establish connectivity between Python and MySQL:
    Username is root
    Password is 12345
    The table exists in a MySQL database named *company*.
    The table has five attributes (Emp_ID, Emp_Name, DOJ, Gender, Salary)

13. Write a python program to update name of employee in Employee table whose employee id is 'E1001' (Take updates name as an input from the user).
    Note the following to establish connectivity between Python and MySQL:
    Username is root
    Password is 12345
    The table exists in a MySQL database named *company*.
    The table has five attributes (Emp_ID, Emp_Name, DOJ, Gender, Salary)

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Candidates must write the Q.P. Code
on the title page of the answer-book.

COMPUTER SCIENCE

Time allowed : 3 hours *Maximum Marks : 70*

- Please check that this question paper contains **15** printed pages.

- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

- Please check that this question paper contains **35** questions.

- **Please write down the serial number of the question in the answer-book before attempting it.**

- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

General Instructions :

*(i) This question paper contains five sections, **Section A to E**.*

*(ii) **All** questions are compulsory.*

*(iii) **Section A** have **18** questions carrying **1** mark each.*

*(iv) **Section B** has **7** Very Short Answer type questions carrying **2** marks each.*

*(v) **Section C** has **5** Short Answer type questions carrying **3** marks each.*

*(vi) **Section D** has **3** Long Answer type questions carrying **5** marks each.*

*(vii) **Section E** has **2** questions carrying **4** marks each. **One** internal choice is given in **Q. 34 and 35,** against Part **(iii)** only.*

(viii) All programming questions are to be answered using Python Language only.

SECTION – A

1. State True or False.   **1**

    "Identifiers are names used to identify a variable, function in a program".

2. Which of the following is a valid keyword in Python ?   **1**

    (a) false   (b) return

    (c) non_local   (d) none

3. Given the following Tuple   **1**

    `Tup= (10, 20, 30, 50)`

    Which of the following statements will result in an error ?

    (a) `print(Tup[0])`   (b) `Tup.insert (2,3)`

    (c) `print(Tup[1:2])`   (d) `print(len(Tup))`

4. Consider the given expression :

    `5<10 and 12>7 or not 7>4`

    Which of the following will be the correct output, if the given expression is evaluated ?   **1**

    (a) `True`   (b) `False`

    (c) `NONE`   (d) `NULL`

5. Select the correct output of the code :   **1**

    ```
    S= "Amrit Mahotsav @ 75"
    A=S.partition (" ")
    print (a)
    ```

    (a) `( 'Amrit Mahotsav','@','75')`

    (b) `['Amrit','Mahotsav','@','75']`

    (c) `('Amrit', 'Mahotsav @ 75')`

    (d) `('Amrit', '', 'Mahotsav @ 75')`

6. Which of the following mode keeps the file offset position at the end of the file ? **1**

(a) r+   (b) r

(c) w   (d) a

7. Fill in the blank. **1**

_____ function is used to arrange the elements of a list in ascending order.

(a) sort()   (b) arrange()

(c) ascending()   (d) asort()

8. Which of the following operators will return either True or False ? **1**

(a) +=   (b) !=

(c) =   (d) *=

9. Which of the following statement(s) would give an error after executing the following code ? **1**

```
Stud={"Murugan":100, "Mithu":95}  # Statement 1
print (Stud[95])                  # Statement 2
Stud ["Murugan"]=99               # Statement 3
print(Stud.pop())                 # Statement 4
print(Stud)                       # Statement 5
```

(a) Statement 2   (b) Statement 3

(c) Statement 4   (d) Statements 2 and 4

10. Fill in the blank. **1**

_____ is a number of tuples in a relation.

(a) Attribute   (b) Degree

(c) Domain   (d) Cardinality

11. The syntax of seek( ) is : **1**
file_object.seek(offset[,reference_point])
What is the default value of reference_point ?

(a) 0   (b) 1

(c) 2   (d) 3

12. Fill in the blank : **1**

_____ clause is used with SELECT statement to display data in a sorted form with respect to a specified column.

(a) WHERE   (b) ORDER BY

(c) HAVING   (d) DISTINCT

13. Fill in the blank :   **1**

_____ is used for point-to-point communication or unicast communication such as radar and satellite.

(a) INFRARED WAVES   (b) BLUETOOTH

(c) MICROWAVES   (d) RADIOWAVES

14. What will the following expression be evaluated to in Python ?   **1**

```
print(4+3*5/3-5%2)
```

(a) 8.5   (b) 8.0

(c) 10.2   (d) 10.0

15. Which function returns the sum of all elements of a list ?   **1**

(a) count()   (b) sum()

(c) total()   (d) add()

16. fetchall() method fetches all rows in a result set and returns a :   **1**

(a) Tuple of lists   (b) List of tuples

(c) List of strings   (d) Tuple of strings

Q. **17** and **18** are ASSERTION (A) and REASONING (R) based questions. Mark the correct choice as

(a) Both (A) and (R) are true and (R) is the correct explanation for (A).

(b) Both (A) and (R) are true and (R) is not the correct explanation for (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

17. **Assertion (A) :** To use a function from a particular module, we need to import the module.   **1**

Reason (R) : import statement can be written anywhere in the program, before using a function from that module.

18. **Assertion (A) :** A stack is a LIFO structure.   **1**

Reason (R) : Any new element pushed into the stack always gets positioned at the index after the last existing element in the stack.

SECTION – B

19. Atharva is a Python programmer working on a program to find and return the maximum value from the list. The code written below has syntactical errors. Rewrite the correct code and underline the corrections made.　　**2**

```
def max_num (L) :
    max=L(0)
    for a in L :
      if a > max
      max=a
    return max
```

20. (a) Differentiate between wired and wireless transmission.　　**2**

OR

(b) Differentiate between URL and domain name with the help of an appropriate example.　　**2**

21. (a) Given is a Python list declaration :　　**1**
```
Listofnames=["Aman","Ankit","Ashish","Rajan","Rajat"]
```
Write the output of :
```
print (Listofnames [-1:-4:-1])
```

(b) Consider the following tuple declaration :　　**1**
```
tup1=(10,20,30,(10,20,30),40)
```
Write the output of :
```
print(tup1.index(20))
```

22. Explain the concept of "Alternate Key" in a Relational Database Management System with an appropriate example.　　**2**

23. (a) Write the full forms of the following :　　**2**
(i) HTML
(ii) TCP

(b) What is the need of Protocols ?

24. (a) Write the output of the code given below :　　**2**
```
def short_sub (lst,n) :
    for i in range (0,n) :
        if len (lst)>4:
            lst [i]=lst [i]+lst[i]
        else:
            lst[i]=lst[i]
subject=['CS','HINDI','PHYSICS','CHEMISTRY','MATHS']
short_sub(subject,5)
print(subject)
```
OR

(b) Write the output of the code given below : **2**

```
a =30
def call (x) :
        global a
        if a%2==0:
                x+=a
        else:
                x-=a
        return x
x=20
print(call(35),end="#")
print(call(40),end= "@")
```

25. (a) Differentiate between CHAR and VARCHAR data types in SQL with appropriate example. **2**

<div align="center">OR</div>

(b) Name any two DDL and any two DML commands. **2**

<div align="center">

SECTION – C

</div>

26. (a) Consider the following tables – LOAN and BORROWER : **1 + 2**

Table : LOAN

LOAN_NO	B_NAME	AMOUNT
L-170	DELHI	3000
L-230	KANPUR	4000

Table : BORROWER

CUST_NAME	LOAN_NO
JOHN	L-171
KRISH	L-230
RAVYA	L-170

How many rows and columns will be there in the natural join of these two tables ?

(b) Write the output of the queries (i) to (iv) based on the table, WORKER given below :

TABLE: WORKER

W_ID	F_NAME	L_NAME	CITY	STATE
102	SAHIL	KHAN	KANPUR	UTTAR PRADESH
104	SAMEER	PARIKH	ROOP NAGAR	PUNJAB
105	MARY	JONES	DELHI	DELHI
106	MAHIR	SHARMA	SONIPAT	HARYANA
107	ATHARVA	BHARDWAJ	DELHI	DELHI
108	VEDA	SHARMA	KANPUR	UTTAR PRADESH

(i) SELECT F_NAME, CITY FROM WORKER ORDER BY STATE DESC;

(ii) SELECT DISTINCT (CITY) FROM WORKER;

(iii) SELECT F_NAME, STATE FROM WORKER WHERE L_NAME LIKE '_HA%';

(iv) SELECT CITY,COUNT(*) FROM WORKER GROUP BY CITY;

27. (a) Write the definition of a Python function named LongLines( ) which reads the contents of a text file named 'LINES.TXT' and displays those lines from the file which have at least 10 words in it. For example, if the content of 'LINES.TXT' is as follows :   3

Once upon a time, there was a woodcutter

He lived in a little house in a beautiful, green wood.

One day, he was merrily chopping some wood.

He saw a little girl skipping through the woods, whistling happily.

The girl was followed by a big gray wolf.

Then the function should display output as :

He lived in a little house in a beautiful, green wood.

He saw a little girl skipping through the woods, whistling happily.

OR

(b) Write a function `count_Dwords()` in Python to count the words ending with a digit in a text file `"Details.txt"`. **3**

Example:

If the file content is as follows :

On seat2 VIP1 will sit and

On seat1 VVIP2 will be sitting

Output will be:

Number of words ending with a digit are 4

28. (a) Write the outputs of the SQL queries (i) to (iv) based on the relations COMPUTER and SALES given below : **2**

Table : COMPUTER

PROD_ID	PROD_NAME	PRICE	COMPANY	TYPE
P001	MOUSE	200	LOGITECH	INPUT
P002	LASER PRINTER	4000	CANON	OUTPUT
P003	KEYBOARD	500	LOGITECH	INPUT
P004	JOYSTICK	1000	IBALL	INPUT
P005	SPEAKER	1200	CREATIVE	OUTPUT
P006	DESKJET PRINTER	4300	CANON	OUTPUT

Table : SALES

PROD_ID	QTY_SOLD	QUARTER
P002	4	1
P003	2	2
P001	3	2
P004	2	1

(i) SELECT MIN(PRICE), MAX(PRICE) FROM COMPUTER;

(ii) SELECT COMPANY, COUNT(*) FROM COMPUTER GROUP BY COMPANY HAVING COUNT(COMPANY) > 1;

(iii) SELECT PROD_NAME, QTY_SOLD FROM COMPUTER C, SALES S WHERE C.PROD_ID=S.PROD_ID AND TYPE = 'INPUT';

(iv) SELECT PROD_NAME, COMPANY, QUARTER FROM COMPUTER C, SALES S WHERE C.PROD_ID=S. PROD_ID;

(b) Write the command to view all databases. **1**

29. Write a function EOReplace() in Python, which accepts a list L of numbers. Thereafter, it increments all even numbers by 1 and decrements all odd numbers by 1. **3**

Example :

If Sample Input data of the list is :

`L=[10,20,30,40,35,55]`

Output will be :

`L=[11,21,31,41,34,54]`

30. (a) A list contains following record of customer:

`[Customer_name, Room Type]`

Write the following user defined functions to perform given operations on the stack named `'Hotel'` :

(i) `Push_Cust()` – To Push customers' names of those customers who are staying in 'Delux' Room Type.

(ii) `Pop_Cust()` – To Pop the names of customers from the stack and display them. Also, display "Underflow" when there are no customers in the stack.

For example :

If the lists with customer details are as follows :

`["Siddarth", "Delux"]`

`["Rahul", "Standard"]`

`["Jerry", "Delux"]`

The stack should contain

`Jerry`

`Siddharth`

The output should be:

`Jerry`

`Siddharth`

`Underflow`

OR

(b) Write a function in Python, `Push (Vehicle)` where, Vehicle is a dictionary containing details of vehicles – `{Car_Name: Maker}`.

The function should push the name of car manufactured by 'TATA' (including all the possible cases like Tata, TaTa, etc.) to the stack. **3**

For example:

If the dictionary contains the following data:

`Vehicle={"Santro":"Hyundai","Nexon":"TATA","Safari":"Tata"}`

The stack should contain

`Safari`

`Nexon`

SECTION – D

31. Quickdev, an IT based firm, located in Delhi is planning to set up a network for its four branches within a city with its Marketing department in Kanpur. As a network professional, give solutions to the questions (i) to (v), after going through the branches locations and other details which are given below :

```
┌─────────────────────────────────┐   ┌─────────────────────────────┐
│        DELHI BRANCH             │   │  KANPUR BRANCH              │
│                                 │   │                             │
│  ┌──────────┐   ┌──────────┐    │   │  ┌──────────────────────┐   │
│  │ BRANCH A │   │ BRANCH B │    │   │  │  MARKETING DEPT.     │   │
│  └──────────┘   └──────────┘    │   │  └──────────────────────┘   │
│                                 │   │                             │
│  ┌──────────┐   ┌──────────┐    │   │                             │
│  │ BRANCH C │   │ BRANCH D │    │   │                             │
│  └──────────┘   └──────────┘    │   │                             │
└─────────────────────────────────┘   └─────────────────────────────┘
```

Distance between various branches is as follows :

Branch	Distance
Branch A to Branch B	40 m
Branch A to Branch C	80 m
Branch A to Branch D	65 m
Branch B to Branch C	30 m
Branch B to Branch D	35 m
Branch C to Branch D	15 m
Delhi Branch to Kanpur	300 km

Number of computers in each of the branches :

Branch	Number of Computers
Branch A	15
Branch B	25
Branch C	40
Branch D	115

(i) Suggest the most suitable place to install the server for the Delhi branch with a suitable reason. 1

(ii) Suggest an ideal layout for connecting all these branches within Delhi. **1**

(iii) Which device will you suggest, that should be placed in each of these branches to efficiently connect all the computers within these branches ? **1**

(iv) Delhi firm is planning to connect to its Marketing department in Kanpur which is approximately 300 km away. Which type of network out of LAN, WAN or MAN will be formed ? Justify your answer. **1**

(v) Suggest a protocol that shall be needed to provide help for transferring of files between Delhi and Kanpur branch. **1**

32. (a) What possible output(s) are expected to be displayed on screen at the time of execution of the following program :

```
import random
M=[5,10,15,20,25,30]
for i in range(1,3):
    first=random.randint(2,5)- 1
    sec=random.randint(3,6)- 2
    third=random.randint(1,4)
    print(M[first],M[sec],M[third],sep="#")
```

(i) 10#25#15
    20#25#25

(ii) 5#25#20
     25#20#15

(iii) 30#20#20
      20#25#25

(iv) 10#15#25#
     15#20#10# **2**

(b) The code given below deletes the record from the table employee which contains the following record structure :

E_code - String

E_name - String

Sal - Integer

City - String

Note the following to establish connectivity between Python and MySQL :

• Username is root

• Password is root

• The table exists in a MySQL database named emp.

• The details (E_code, E_name, Sal, City) are the attributes of the table.

Write the following statements to complete the code :

Statement 1 – to import the desired library.

Statement 2 – to execute the command that deletes the record with E_code as 'E101'.

Statement 3 – to delete the record permanently from the database.

```
import _____ as mysql       # Statement 1
def delete( ) :
    mydb=mysql.connect(host="localhost",user="root",
    passwd="root",database="emp")

    mycursor=mydb.cursor( )
    _____       # Statement 2
    _____       # Statement 3
    print ("Record deleted")
```
3

OR

(a) Predict the output of the code given below :

```
def makenew(mystr):
    newstr=""
    count=0
    for i in mystr:
        if count%2!=0:
            newstr=newstr+str(count)
        else :
            if i.lower():
                newstr=newstr+i.upper()
            else:
                newstr=newstr+i
        count+=1
    print(newstr)
makenew("No@1")
```
2

(b)   The code given below reads the following records from the table `employee` and displays only those records who have employees coming from city 'Delhi':

> `E_code` - String
>
> `E_name` - String
>
> `Sal` - Integer
>
> `City` - String

Note the following to establish connectivity between Python and MySQL :

- Username is `root`

- Password is `root`

- The table exists in a MySQL database named `emp`.

- The details (`E_code, E_name, Sal, City`) are the attributes of the table.

Write the following statements to complete the code :

Statement 1 – to import the desired library.

Statement 2 – to execute the query that fetches records of the employees coming from city 'Delhi'.

Statement 3 – to read the complete data of the query (rows whose city is Delhi) into the object named `details`, from the table `employee` in the database.   **3**

```
import _____ as mysql        # Statement 1
def display():
    mydb=mysql.connect(host="localhost",user="root",
    passwd="root",database="emp")
    mycursor=mydb.cursor()
    _____        # Statement 2
    details = _____        # Statement 3
    for i in details:
        print (i)
```

33. (a) Write one difference between CSV and text files.   **5**
    Write a program in Python that defines and calls the following user defined functions :
    (i)   `COURIER_ADD()`: It takes the values from the user and adds the details to a csv file `'courier.csv'`. Each record consists of a list with field elements as `cid`, `s_name`, `Source`, `destination` to store Courier ID, Sender name, Source and destination address respectively.
    (ii) `COURIER_SEARCH()` : Takes the destination as the input and displays all the courier records going to that destination.

OR

(b) Why it is important to close a file before exiting ?
    Write a program in Python that defines and calls the following user defined functions :   **5**
    (i)   Add_Book() : Takes the details of the books and adds them to a csv file 'Book.csv'. Each record consists of a list with field elements as `book_ID`, `B_name` and `pub` to store book ID, book name and publisher respectively.
    (ii) Search_Book() : Takes publisher name as input and counts and displays number of books published by them.

SECTION – E

34. The school has asked their estate manager Mr. Rahul to maintain the data of all the labs in a table LAB. Rahul has created a table and entered data of 5 labs.

LABNO	LAB_NAME	INCHARGE	CAPACITY	FLOOR
L001	CHEMISTRY	Daisy	20	I
L002	BIOLOGY	Venky	20	II
L003	MATH	Preeti	15	I
L004	LANGUAGE	Daisy	36	III
L005	COMPUTER	Mary Kom	37	II

Based on the data given above answer the following questions :
(i)   Identify the columns which can be considered as Candidate keys.   **1**
(ii) Write the degree and cardinality of the table.   **1**
(iii) Write the statements to :   **2**
    (a) Insert a new row with appropriate data.
    (b) Increase the capacity of all the labs by 10 students which are on 'I' Floor.

OR
(Option for part (iii) only)

(iii) Write the statements to :
    (a) Add a constraint PRIMARY KEY to the column LABNO in the table.
    (b) Delete the table LAB.   **2**

35. Shreyas is a programmer, who has recently been given a task to write a user defined function named `write_bin( )` to create a binary file called `Cust_file.dat` containing customer information – customer number (`c_no`), name (`c_name`), quantity (`qty`), price (`price`) and amount (`amt`) of each customer.

The function accepts customer number, name, quantity and price. Thereafter, it displays the message 'Quantity less than 10..... Cannot SAVE', if quantity entered is less than 10. Otherwise the function calculates amount as `price * quantity` and then writes the record in the form of a list into the binary file.

```
import pickle
def write_bin():
   bin_file=_____   #Statement 1
   while True:
      c_no=int(input("enter customer number"))
      c_name=input("enter customer name")
      qty=int(input("enter qty"))
      price=int(input("enter price"))
      if _____    #Statement 2
        print("Quantity less than 10..Cannot SAVE")
      else:
        amt=price * qty
        c_detail=[c_no,c_name,qty,price,amt]
        _____    #Statement 3
        ans=input("Do you wish to enter more records y/n")
        if ans.lower()=='n':
              _____   #Statement 4
      _____   #Statement 5
   _____   #Statement 6
```

(i)   Write the correct statement to open a file `'Cust_file.dat'` for writing the data of the customer.   **1**

(ii) Which statement should Shreyas fill in Statement 2 to check whether quantity is less than 10.   **1**

(iii) Which statement should Shreyas fill in Statement 3 to write data to the binary file and in Statement 4 to stop further processing if the user does not wish to enter more records.   **2**

OR
(Option for part (iii) only)

(iii) What should Shreyas fill in Statement 5 to close the binary file named `Cust_file.dat` and in Statement 6 to call a function to write data in binary file ?   **2**

Class: XII Session: 2023-24

Computer Science (083)

Sample Question Paper (Theory)

Time allowed: 3 Hours   **Maximum Marks: 70**

<u>**General Instructions:**</u>

- **Please check this question paper contains 35 questions.**
- **The paper is divided into 4 Sections- A, B, C, D and E.**
- **Section A, consists of 18 questions (1 to 18). Each question carries 1 Mark.**
- **Section B, consists of 7 questions (19 to 25). Each question carries 2 Marks.**
- **Section C, consists of 5 questions (26 to 30). Each question carries 3 Marks.**
- **Section D, consists of 2 questions (31 to 32). Each question carries 4 Marks.**
- **Section E, consists of 3 questions (33 to 35). Each question carries 5 Marks.**
- **All programming questions are to be answered using Python Language only.**

Ques No	Question	Marks
	## SECTION A	
1	State True or False: "In a Python program, if a `break` statement is given in a nested loop, it terminates the execution of all loops in one go."	1
2	In a table in MYSQL database, an attribute A of datatype `varchar(20)` has the value "`Keshav`". The attribute B of datatype `char(20)` has value "`Meenakshi`". How many characters are occupied by attribute A and attribute B? a. 20,6 b. 6,20 c. 9,6 d. 6,9	1
3	What will be the output of the following statement: `print(3-2**2**3+99/11)` a. 244 b. 244.0 c. -244.0 d. Error	1
4	Select the correct output of the code:	1

```
s = "Python is fun"
l = s.split()
s_new = "-".join([l[0].upper(), l[1], l[2].capitalize()])
print(s_new)
```

Options:

   a. PYTHON-IS-Fun
   b. PYTHON-is-Fun
   c. Python-is-fun
   d. PYTHON-Is -Fun

5	In MYSQL database, if a table, **Alpha** has degree 5 and cardinality 3, and another table, **Beta** has degree 3 and cardinality 5, what will be the degree and cardinality of the Cartesian product of **Alpha** and **Beta**? a. 5,3 b. 8,15 c. 3,5 d. 15,8	1
6	Riya wants to transfer pictures from her mobile phone to her laptop. She uses Bluetooth Technology to connect two devices. Which type of network will be formed in this case? a. PAN b. LAN c. MAN d. WAN	1

7	Which of the following will delete key-value pair for key = "Red" from a dictionary D1?
	
	 `a. delete D1("Red")`
	 `b. del D1["Red"]`
	 `c. del.D1["Red"]`
	 `d. D1.del["Red"]`
		1

8	Consider the statements given below and then choose the correct output from the given options:
	 `pride="#G20 Presidency"`
	 `print(pride[-2:2:-2])`
		1

9	Which of the following statement(s) would give an error during execution of the following code?
	
	``python
	tup = (20,30,40,50,80,79)
	print(tup) #Statement 1
	print(tup[3]+50) #Statement 2
	print(max(tup)) #Statement 3
	tup[4]=80 #Statement 4
	``
	
	Options:
	
	  a. Statement 1
	
	  b. Statement 2
	
	  c. Statement 3
	
	  d. Statement 4
		1

10	What possible outputs(s) will be obtained when the following code is executed?
	
	``python
	import random
	myNumber=random.randint(0,3)
	COLOR=["YELLOW","WHITE","BLACK","RED"]
	for I in range(1,myNumber):
	    print(COLOR[I],end="*")
	    print()
	``
	
	Options:
	
	  a.
		1

RED*

WHITE*

BLACK*

b.

WHITE*

BLACK*

c.

WHITE* WHITE*

BLACK* BLACK*

d.

YELLOW*

WHITE*WHITE*

BLACK* BLACK* BLACK*

11	Fill in the blank:
	
	The modem at the sender's computer end acts as a _____.
	
	   a. Model
	   b. Modulator
	   c. Demodulator
	   d. Convertor
		1

12	Consider the code given below:
	
	``
	b=100
	def test(a):
	    _____ # missing statement
	    b=b+a
	    print(a,b)
	test(10)
	print(b)
	``
		1

	Which of the following statements should be given in the blank for #Missing Statement, if the output produced is 110?
	
	 Options:
	   a. `global a`
	   b. `global b=100`
	   c. `global b`
	   d. `global a=100`	

13	State whether the following statement is True or False: An exception may be raised even if the program is syntactically correct.	1

14	Which of the following statements is FALSE about keys in a relational database?
	   a. Any candidate key is eligible to become a primary key.
	   b. A primary key uniquely identifies the tuples in a relation.
	   c. A candidate key that is not a primary key is a foreign key.
	   d. A foreign key is an attribute whose value is derived from the primary key of another relation.
		1

15	Fill in the blank: In case of _____ switching, before a communication starts, a dedicated path is identified between the sender and the receiver.	1

16	Which of the following functions changes the position of file pointer and returns its new position?
	   a. `flush()`
	   b. `tell()`
	   c. `seek()`
	   d. `offset()`
		1

	Q17 and 18 are ASSERTION AND REASONING based questions. Mark the correct choice as
	   (a) Both A and R are true and R is the correct explanation for A
	   (b) Both A and R are true and R is not the correct explanation for A	

	(c) A is True but R is False		
	(d) A is false but R is True		
17	Assertion(A): List is an immutable data type Reasoning(R): When an attempt is made to update the value of an immutable variable, the old variable is destroyed and a new variable is created by the same name in memory.	1	
18	Assertion(A): Python Standard Library consists of various modules. Reasoning(R): A function in a module is used to simplify the code and avoids repetition.	1	

SECTION B

19	(i) Expand the following terms:
	
	      POP3 , URL
	
	(ii) Give one difference between XML and HTML.
	
	            OR
	
	(i) Define the term bandwidth with respect to networks.
	
	(ii) How is http different from https?
		1+1=2

20	The code given below accepts a number as an argument and returns the reverse number. Observe the following code carefully and rewrite it after removing **all syntax and logical errors**. Underline all the corrections made.
	
	<pre>define revNumber(num):
	    rev = 0
	    rem = 0
	    While num > 0:
	        rem ==num %10
	        rev = rev*10 + rem
	        num = num//10
	        return rev
	print(revNumber(1234))</pre>
		2

21	Write a function `countNow(PLACES)` in Python, that takes the dictionary, `PLACES` as an argument and displays the names (in uppercase)of the places whose names are longer than 5 characters. For example, Consider the following dictionary `PLACES={1:"Delhi",2:"London",3:"Paris",4:"New York",5:"Doha"}` The output should be: LONDON NEW YORK OR Write a function, `lenWords(STRING)`, that takes a string as an argument and returns a tuple containing length of each word of a string. For example, if the string is `"Come let us have some fun"`, the tuple will have `(4, 3, 2, 4, 4, 3)`	2

22	Predict the output of the following code:
	
	``python
	S = "LOST"
	L = [10,21,33,4]
	D={}
	for I in range(len(S)):
	    if I%2==0:
	        D[L.pop()] = S[I]
	    else:
	        D[L.pop()] = I+3
	
	for K,V in D.items():
	    print(K,V,sep="*")
	``
		2

23	Write the Python statement for **each** of the following tasks using BUILT-IN functions/methods only: (i) To insert an element `200` at the third position, in the list `L1`. (ii) To check whether a string named, `message` ends with a full stop / period or not.	1+1= 2

A list named `studentAge` stores age of students of a class. Write the Python command to import the required module and (using built-in function) to display the most common age value from the given list.

24	Ms. Shalini has just created a table named "Employee" containing columns `Ename`, `Department` and `Salary`. After creating the table, she realized that she has forgotten to add a primary key column in the table. Help her in writing an SQL command to add a primary key column `EmpId` of integer type to the table `Employee`. Thereafter, write the command to insert the following record in the table: `EmpId`- 999 `Ename`- Shweta `Department`: Production `Salary`: 26900 OR Zack is working in a database named `SPORT`, in which he has created a table named "`Sports`" containing columns `SportId`, `SportName`, `no_of_players`, and `category`. After creating the table, he realized that the attribute, `category` has to be deleted from the table and a new attribute `TypeSport` of data type string has to be added. This attribute `TypeSport` cannot be left blank. Help Zack write the commands to complete both the tasks.	2
25	Predict the output of the following code:	2

```python
def Changer(P,Q=10):
    P=P/Q
    Q=P%Q
    return P

A=200
B=20
A=Changer(A,B)
print(A,B, sep='$')
B=Changer(B)
print(A,B, sep='$', end='###')
```

SECTION C

26	Predict the output of the Python code given below:	3

```python
Text1="IND-23"
Text2=""
I=0
while I<len(Text1):
    if Text1[I]>="0" and Text1[I]<="9":
        Val = int(Text1[I])
        Val = Val + 1
        Text2=Text2 + str(Val)
    elif Text1[I]>="A" and Text1[I]<="Z":
        Text2=Text2 + (Text1[I+1])
    else:
        Text2=Text2 + "*"
    I+=1
print(Text2)
```

27	Consider the table CLUB given below and write the output of the SQL queries that follow.	1*3= 3

CID	CNAME	AGE	GENDER	SPORTS	PAY	DOAPP
5246	AMRITA	35	FEMALE	CHESS	900	2006-03-27

4687	SHYAM	37	MALE	CRICKET	1300	2004-04-15	
1245	MEENA	23	FEMALE	VOLLEYBALL	1000	2007-06-18	
1622	AMRIT	28	MALE	KARATE	1000	2007-09-05	
1256	AMINA	36	FEMALE	CHESS	1100	2003-08-15	
1720	MANJU	33	FEMALE	KARATE	1250	2004-04-10	
2321	VIRAT	35	MALE	CRICKET	1050	2005-04-30	

	(i) SELECT COUNT(DISTINCT SPORTS) FROM CLUB;
	(ii) SELECT CNAME, SPORTS FROM CLUB WHERE
	      DOAPP<"2006-04-30" AND CNAME LIKE "%NA";
	(iii) SELECT CNAME, AGE, PAY FROM CLUB WHERE
	      GENDER = "MALE" AND PAY BETWEEN 1000 AND
	      1200;	

28	Write a function in Python to read a text file, `Alpha.txt` and displays those lines which begin with the word 'You'. OR Write a function, `vowelCount()` in Python that counts and displays the number of vowels in the text file named `Poem.txt`.	3
29	Consider the table `Personal` given below: **Table: Personal**	1*3=3

P_ID	Name	Desig	Salary	Allowance	
P01	Rohit	Manager	89000	4800	

[10]

P02	Kashish	Clerk	NULL	1600
P03	Mahesh	Superviser	48000	NULL
P04	Salil	Clerk	31000	1900
P05	Ravina	Superviser	NULL	2100

Based on the given table, write SQL queries for the following:

    (i)   Increase the salary by 5% of personals whose allowance is known.

    (ii)   Display Name and Total Salary (sum of Salary and Allowance) of all personals. The column heading 'Total Salary' should also be displayed.

    (iii)   Delete the record of personals who have salary greater than 25000

30	A list, `NList` contains following record as list elements:	3

A list, `NList` contains following record as list elements:

`[City, Country, distance from Delhi]`

Each of these records are nested together to form a nested list. Write the following user defined functions in Python to perform the specified operations on the stack named `travel`.

    (i)   **Push_element(NList):** It takes the nested list as an argument and pushes a list object containing name of the city and country, which are not in India and distance is less than 3500 km from Delhi.

    (ii)   **Pop_element():** It pops the objects from the stack and displays them. Also, the function should display "Stack Empty" when there are no elements in the stack.

For example: If the nested list contains the following data:

`NList=[["New York", "U.S.A.", 11734],`

`["Naypyidaw", "Myanmar", 3219],`

`["Dubai", "UAE", 2194],`

`["London", "England", 6693],`

```
["Gangtok", "India", 1580],

["Columbo", "Sri Lanka", 3405]]
```

The stack should contain:

```
['Naypyidaw', 'Myanmar'],

['Dubai', 'UAE'],

['Columbo', 'Sri Lanka']
```

The output should be:

```
['Columbo', 'Sri Lanka']

['Dubai', 'UAE']

['Naypyidaw', 'Myanmar']

Stack Empty
```

SECTION D

| 31 | Consider the tables PRODUCT and BRAND given below: | 1*4= 4 |

Table: PRODUCT

PCode	PName	UPrice	Rating	BID
P01	Shampoo	120	6	M03
P02	Toothpaste	54	8	M02
P03	Soap	25	7	M03
P04	Toothpaste	65	4	M04
P05	Soap	38	5	M05
P06	Shampoo	245	6	M05

Table: BRAND

BID	BName
M02	Dant Kanti
M03	Medimix
M04	Pepsodent
M05	Dove

[12]

		Write SQL queries for the following:	
		(i) Display product name and brand name from the tables PRODUCT and BRAND.	
		(ii) Display the structure of the table PRODUCT.	
		(iii) Display the average rating of Medimix and Dove brands	
		(iv) Display the name, price, and rating of products in descending order of rating.	
32		Vedansh is a Python programmer working in a school. For the Annual Sports Event, he has created a csv file named `Result.csv`, to store the results of students in different sports events. The structure of `Result.csv` is : `[St_Id, St_Name, Game_Name, Result]` Where `St_Id` is Student ID (integer) `ST_name` is Student Name (string) `Game_Name` is name of game in which student is participating(string) Result is result of the game whose value can be either `'Won', 'Lost'` or `'Tie'` For efficiently maintaining data of the event, Vedansh wants to write the following user defined functions: `Accept()` – to accept a record from the user and add it to the file `Result.csv`. The column headings should also be added on top of the csv file. `wonCount()` – to count the number of students who have won any event. As a Python expert, help him complete the task.	4
		SECTION E	

| 33 | Meticulous EduServe is an educational organization. It is planning to setup its India campus at Chennai with its head office at Delhi. The Chennai campus has 4 main buildings – ADMIN, ENGINEERING, BUSINESS and MEDIA | 1*5= 5 |

Block to Block distances (in Mtrs.)

From	To	Distance
ADMIN	ENGINEERING	55 m
ADMIN	BUSINESS	90 m
ADMIN	MEDIA	50 m
ENGINEERING	BUSINESS	55 m
ENGINEERING	MEDIA	50 m
BUSINESS	MEDIA	45 m
DELHI HEAD OFFICE	CHENNAI CAMPUS	2175 km

Number of computers in each of the blocks/Center is as follows:

ADMIN	110
ENGINEERING	75
BUSINESS	40
MEDIA	12
DELHI HEAD	20

a) Suggest and draw the cable layout to efficiently connect various blocks of buildings within the CHENNAI campus for connecting the digital devices.

	b) Which network device will be used to connect computers in each block to form a local area network? c) Which block, in Chennai Campus should be made the server? Justify your answer. d) Which fast and very effective wireless transmission medium should preferably be used to connect the head office at DELHI with the campus in CHENNAI? e) Is there a requirement of a repeater in the given cable layout? Why/ Why not?	
34	(i) Differentiate between r+ and w+ file modes in Python. (ii) Consider a file, SPORT.DAT, containing records of the following structure: [SportName, TeamName, No_Players] Write a function, copyData(), that reads contents from the file SPORT.DAT and copies the records with Sport name as "**Basket Ball**" to the file named BASKET.DAT. The function should return the total number of records copied to the file BASKET.DAT. **OR** (i) How are text files different from binary files? (ii) A Binary file, CINEMA.DAT has the following structure: {MNO:[MNAME, MTYPE]} Where MNO – Movie Number MNAME – Movie Name MTYPE is Movie Type Write a user defined function, findType(mtype), that accepts mtype as parameter and displays all the records from the binary file CINEMA.DAT, that have the value of Movie Type as mtype.	2+3= 5
35	(i) Define the term Domain with respect to RDBMS. Give one example to support your answer.	1+4= 5

(ii) Kabir wants to write a program in Python to insert the following record in the table named `Student` in MYSQL database, SCHOOL:

- `rno`(Roll number)- integer
- `name`(Name) - string
- `DOB` (Date of birth) – Date
- `Fee` – float

Note the following to establish connectivity between Python and MySQL:

- Username - `root`
- Password - `tiger`
- Host - `localhost`

The values of fields `rno, name, DOB` and `fee` has to be accepted from the user. Help Kabir to write the program in Python.

OR

(i) Give one difference between alternate key and candidate key.

(ii) Sartaj has created a table named `Student` in MYSQL database, `SCHOOL`:

- `rno`(Roll number)- integer
- `name`(Name) - string
- `DOB` (Date of birth) – Date
- `Fee` – float

Note the following to establish connectivity between Python and MySQL:

- Username - `root`
- Password - `tiger`
- Host - `localhost`

[16]

Sartaj, now wants to display the records of students whose fee is more than 5000. Help Sartaj to write the program in Python.

Class XII

Computer Science (083)

Marking Scheme

Time Allowed: 3 hours   **MM: 70**

Ques No	Question and Answers	Distribution of Marks	Total Marks
	SECTION A		
1	False	1 mark for correct answer	1
2	Option b 6,20	1 mark for correct answer	1
3	Option c -244.0	1 mark for correct answer	1
4	PYTHON-is-Fun	1 mark for correct answer	1
5	Option b 8,15	1 mark for correct answer	1
6	Option a PAN	1 mark for correct answer	1
7	Option b `del D1["Red"]`	1 mark for correct answer	1
8	Option b	1 mark for correct answer	1

	ceieP0		
9	Option d

Statement 4 | 1 mark for correct answer | 1 |
| 10 | Option b

    WHITE*
    BLACK* | 1 mark for correct answer | 1 |
| 11 | Option b

Modulator | 1 mark for correct answer | 1 |
| 12 | Option c

global b | 1 mark for correct answer | 1 |
| 13 | True | 1 mark for correct answer | 1 |
| 14 | Option c

A candidate key that is not a primary key is a foreign key. | 1 mark for correct answer | 1 |
| 15 | Circuit | 1 mark for correct answer | 1 |
| 16 | Option c

`seek()` | 1 mark for correct answer | 1 |
| 17 | Option d
A is false but R is True | 1 mark for correct answer | 1 |

18	Option b Both A and R are true but R is not the correct explanation for A	1 mark for correct answer	1

SECTION B

| 19 | (i)

POP3 – Post Office Protocol 3

URL – Uniform Resource Locator

(ii)

HTML(Hyper text mark Up language)

• We use pre-defined tags
• Static web development language – only focuses on how data looks
• It use for only displaying data, cannot transport data
• Not case sensistive

XML (Extensible Markup Language)

• we can define our own tags and use them
• Dynamic web development language – as it is used for transporting and storing data
• Case sensitive
<div align="center">OR</div>
(i)   Bandwidth is the maximum rate of data transfer over a given transmission medium. / The amount of information that can be transmitted over a network. | ½ mark for each correct expansion

1 mark for any one correct difference

No mark to be awarded if only full form is given

1 mark for correct definition | 1+1=2 |

	(ii) https (Hyper Text Transfer Protocol Secure) is the protocol that uses SSL (Secure Socket Layer) to encrypt data being transmitted over the Internet. Therefore, https helps in secure browsing while http does not.	1 mark for correct difference.		
| 20 | ```
def revNumber(num):
    rev = 0
    rem = 0
    while num > 0:
        rem =num %10
        rev = rev*10 + rem
        num = num//10
    return rev
print(revNumber(1234))
``` | ½ mark for each correction made | 2 |
| 21 | ```
PLACES={1:"Delhi",2:"London",3:"Paris",4:"New York",5:"Dubai"}
def countNow(PLACES):
    for place in PLACES.values():
        if len(place)>5:
            print(place.upper())
countNow(PLACES)
```

OR | ½ mark for correct function header

½ mark for correct loop

½ mark for correct if statement

½ mark for displaying the output

½ mark for correct function header

½ mark for using split() | 2 |

[4]

	``python
def lenWords(STRING):
    T=()
    L=STRING.split()
    for word in L:
        length=len(word)
        T=T+(length,)
    return T
```
**Note: Any other correct logic may be marked** | ½ mark for adding to tuple<br><br>½ mark for return statement | |
| 22 | 4\*L<br><br>33\*4<br><br>21\*S<br><br>10\*6 | ½ mark for each correct line of output | 2 |
| 23 | (i)  L1.insert(2,200)<br><br>(ii) message.endswith('.')<br><br><br>OR<br><br>import statistics<br>print(statistics.mode(studentAge) ) | 1 mark for each correct statement<br><br><br><br>1 mark for correct import statement<br><br>1 mark for correct command with mode() and print() | 1+1=2 |
| 24 | SQL Command to add primary key:<br><br>ALTER TABLE Employee ADD EmpId INTEGER<br>PRIMARY KEY; | 1 mark for correct ALTER TABLE command | 2 |

[5]

| | | | |
|---|---|---|---|
| | As the primary key is added as the last field, the command for inserting data will be:<br><br>`INSERT INTO Employee`<br>`VALUES("Shweta","Production",26900,999);`<br>Alternative answer:<br>`INSERT INTO`<br>`Employee(EmpId,Ename,Department,Salary)`<br>`VALUES(999,"Shweta","Production",26900);`<br><br>OR<br><br>To delete the attribute, category:<br>`ALTER TABLE Sports`<br>`DROP category;`<br><br>To add the attribute, TypeSport<br><br>`ALTER TABLE Sports`<br>`ADD TypeSport char(10) NOT NULL;` | 1 mark for correct INSERT command<br><br><br><br><br><br><br>1 mark for correct ALTER TABLE command with DROP<br><br>1 mark for correct ALTER TABLE command with ADD | |
| 25 | 10.0$20<br>10.0$2.0### | 1 mark for each correct line of output | 2 |

# SECTION C

| | | | |
|---|---|---|---|
| 26 | ND-*34 | ½ mark for each correct character | 3 |
| 27 | | | |
| | (i)<br><br>`COUNT(DISTINCT SPORTS)` | 1 mark for each correct output | 1*3=3 |

4

(ii)

| CNAME | SPORTS |
|-------|--------|
| AMINA | CHESS |

(iii)

| CNAME | AGE | PAY |
|-------|-----|------|
| AMRIT | 28 | 1000 |
| VIRAT | 35 | 1050 |

| 28 | ```python
def test():
    fObj1 = open("Alpha.txt","r")
    data = fObj1.readlines()
    for line in data:
        L=line.split()
        if L[0]=="You":
            print(line)
    fObj1.close()
```

OR | 1 mark for correctly opening and closing files

½ mark for correctly reading data

1 mark for correct loop and if statement

½ mark for displaying data

1 mark for correctly opening and closing the files | 3 |

```
def vowelCount():
    fObj = open("Alpha.txt","r")
    data = str(fObj.read())
    cnt=0
    for ch in data:
        if ch in "aeiouAEIOU":
            cnt=cnt+1
    print(cnt)
    fObj.close()
```

Note: Any other correct logic may be marked

		½ mark for correctly reading data 1 mark for correct loop and if statement ½ mark for displaying the output.	

29	(i)
	
	    UPDATE Personal
	
	    SET Salary=Salary + Salary*0.5
	
	    WHERE Allowance IS NOT NULL;
	
	(ii)
	
	    SELECT Name, Salary + Allowance AS
	
	    "Total Salary" FROM Personal;
	
	(iii)
	
	    DELETE FROM Personal
	
	    WHERE Salary>25000
		1 mark for each correct query	1*3=3

[8]

| 30 | ```python
travel = []
def Push_element(NList):
    for L in NList:
        if L[1] != "India" and L[2]<3500:
            travel.append([L[0],L[1]])


def Pop_element():
    while len(travel):
        print(travel.pop())
    else:
        print("Stack Empty")
``` | 1 ½ marks for each function | 3 |

SECTION D

| 31 | (i)

    SELECT PName, BName FROM PRODUCT P,
    BRAND B WHERE P.BID=B.BID;

(ii)

    DESC PRODUCT;

(iii)

    SELECT BName, AVG(Rating) FROM PRODUCT
    P, BRAND B
    WHERE P.BID=B.BID
    GROUP BY BName
    HAVING BName='Medimix' OR
    BName='Dove';

(iv)

    SELECT PName, UPrice, Rating
    FROM PRODUCT
    ORDER BY Rating DESC; | 1 mark for each correct query | 1*4=4 |

| 32 | ```python
def Accept():
    sid=int(input("Enter Student ID "))
    sname=input("Enter Student Name ")
    game= input("Enter name of game ")
    res=input("Enter Result")
    headings=["Student ID","Student Name"," Game Name", "Result"]
    data=[sid,sname,game,res]
    f=open('Result.csv','a',newline='')
    csvwriter=csv.writer(f)
    csvwriter.writerow(headings)
    csvwriter.writerow(data)
    f.close()


def wonCount():
    f=open('Result.csv','r')
    csvreader=csv.reader(f, delimiter=',')
    head=list(csvreader)
    print(head[0])
    for x in head:
        if x[3]=="WON":
            print(x)
    f.close()
``` | ½ mark for accepting data correctly

½ mark for opening and closing file

½ mark for writing headings

½ mark for writing row

½ mark for opening and closing file

½ mark for reader object

½ mark for print heading

½ mark for printing data | 4 |

SECTION E

| 33 | a)

 Bus Topology

  | 1 mark for each correct answer | 1*5=5 |

	b) Switch			
	c) Admin block, as it has maximum number of computers.			
	d) Microwave			
	e) No, a repeater is not required in the given cable layout as the length of transmission medium between any two blocks does not exceed 70 m.			
34	(i) r+ mode: • Primary function is reading • File pointer is at beginning of file • if the file does not exist, it results in an error w+ mode: • primary function is writing • if the file does not exist, it creates a new file. • If the file exists, previous data is overwritten • File pointer is at the beginning of file (ii)		1 mark for each correct difference (minimum two differences should be given) ½ mark for correctly opening and closing files ½ mark for correct try and except block ½ mark for correct loop 1 mark for correctly copying data	2+3=5

```
def copyData():
    fObj = open("SPORT.DAT", "rb")
    fObj1 = open("BASKET.DAT","wb")
    cnt=0
    try:
        while True:
            data = pickle.load(fObj)
            print(data)
            if data[0] == "Basket Ball":
                pickle.dump(data,fObj1)
                cnt+=1
    except:
        fObj.close()
        fObj1.close()
    return cnt
```

OR

(i)   Text files:

- Extension is .txt

- Data is stored in ASCII format that is human readable

- Has EOL character that terminates each line of data stored in the text files

Binary Files

- Extension is .dat

- Data is stored in binary form (0s and 1s), that is not human readable.

(ii)

½ mark for correct return statement

½ mark for correctly opening and closing files

½ mark for correct try and except block

½ mark for correct loop

½ mark for correct if statement

1 mark for correctly displaying data

```
def Searchtype(mtype):
    fObj = open("CINEMA.DAT", "rb")
    try:
        while True:
            data = pickle.load(fObj)
            if data[2] == mtype:
                print("Movie number:",data[0])
                print("Movie Name:",data[1])
                print("Movie Type:",data[2])
    except EOFError:
        fObj.close()
```

Note: Any other correct logic may be marked

35	(i)	Domain is a set of values from which an attribute can take value in each row. For example, roll no field can have only integer values and so its domain is a set of integer values	½ mark for correct definition ½ mark for correct example	1+4=5
|    | (ii) | ```
import mysql.connector as mysql
con1 = mysql.connect(host="localhost",user="root", password="tiger", database="sample2023")
mycursor=con1.cursor()
rno = int(input("Enter Roll Number:: "))
name = input("Enter the name:: ")
DOB = input("Enter date of birth:: ")
fee= float(input("Enter Fee:: "))
query = "INSERT into student values({},'{}','{}',{})".format(rno,name,DOB,fee)
mycursor.execute(query)
con1.commit()
print("Data added successfully")
con1.close()
```<br><br>**Note: Any other correct logic may be marked** | ½ mark for importing correct module<br><br>1 mark for correct connect()<br><br>½ mark for correctly accepting the input<br><br>1 ½ mark for correctly |  |

½ mark for correctly using commit()

OR

(i)   All keys that have the properties to become a primary key are candidate keys. The candidate keys that do not become primary keys are alternate keys.

1 mark for correct difference

(ii)

```
import mysql.connector as mysql
con1 = mysql.connect(host="localhost",user="root", password="tiger", database="sample2023")
mycursor=con1.cursor()
query = "SELECT * FROM student where fee>{}".format(5000)
mycursor.execute(query)
data=mycursor.fetchall()
for rec in data:
    print(rec)
con1.close()
```

½ mark for importing correct module

1 mark for correct connect()

1 mark for correctly executing the query

½ mark for correctly using fetchall()

1 mark for correctly

			displaying data	

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CLASS: XII SESSION: 2023-24

COMPUTER SCIENCE (083)

PRACTICE SET

</div>

Time allowed: 3 Hours   *Maximum Marks: 70*

General Instructions:

- Please check this question paper contains 35 questions.
- The paper is divided into 5 Sections- A, B, C, D and E.
- Section A, consists of 18 questions (1 to 18). Each question carries 1 Mark.
- Section B, consists of 7 questions (19 to 25). Each question carries 2 Marks.
- Section C, consists of 5 questions (26 to 30). Each question carries 3 Marks.
- Section D, consists of 2 questions (31 to 32). Each question carries 4 Marks.
- Section E, consists of 3 questions (33 to 35). Each question carries 5 Marks.
- All programming questions are to be answered using Python Language only.

QUES NO.	QUESTION	MARKS
	SECTION A	
1	State True or False: In MySQL, the GROUP BY clause is used to combine all such records of a table which have identical values in specified field(s).	1
2.	Which of the following statements is not valid for CSV files? a. CSV files are the text files. b. The newline argument suppresses blank rows in the file. c. By default, EOL takes place while writing data into the file. d. None of the above.	1
3.	What will be the value of **p** when **p=int(17/2+11.5)**? 20 b. 20.0 c. 28 d. 28.0	1
4.	_____ error occurs when an identifier used in the expression does not find its value during run time. a. ValueError b. TypeError c. NameError d. IdentifierError	1
5.	To work with MySQL, you need to enter a password, known as_____ a. Root password b. System Password c. MySQL Password d. Data Language Password	1

6.	Physical or logical arrangement of network refers to as:
	
	   a. Routing
	   b. Looping
	   c. Topology
	   d. Networking
		1

7.	Write the output of the code given below:
	T= (12,72,34,76,21,89,4,83,11,2)
	RESULT = list(T [-4:])
	print(RESULT)
	   a. [4, 83, 11, 2]
	   b. (89,4, 83, 11)
	   c. (4,83,11,2)
	   d. [89,4,83,11]
		1

8.	Find the output of the following code: String = "Python Programming" String.isalnum() (a) True (b) False (c) TypeError (d) None of these	1
9.	What is output of following code segment T= min(1,6,0,-3,100) (a) 1 (b) -3 (c) 0 (d) None of above	1

10.	What is the purpose of the random module?
	   a.) To generate random numbers for cryptography.
	   b.) To generate random numbers for statistical analysis
	   c.) To generate random numbers for various applications.
	   d.) To generate truly random numbers for secure applications.
		1

11.	The internet facility that facilitates remote login is: a. HTTP b. FTP c. TELNET d. LAN	1
12.	A _____ is a block of organized and reusable code. a. Parameter b. Argument c. Definition d. Function	1

13.	Stack is a linear data structure which implements?
	   a. Last in First out
	   b. Last in Last out
	   c. First in First out
	   d. None of the above
		1

14.	Which of the following TCP/IP protocols is used for transferring files from one computer to another? a. FTP b. PPP c. SMTP d. HTTP	1
15.	Which of the following statement is correct for 'wb+' mode? a. It enables writing and reading operations.	1

	b. It disables writing but enables reading operations. c. It enables reading followed by writing operations. d. None of the above	
16.	Which of the following function is used with the csv modules in Python to read the content of a csv file into an object? a. readrow() b. readrows() c. reader() d. load()	1
	Q17 and 18 are ASSERTION (A) and REASONING (R) based questions. Mark the correct choice as (a) Both A and R are true and R is the correct explanation for A (b) Both A and R are true and R is not the correct explanation for A (c) A is True but R is False. (d) A is false but R is True	
17.	**Assertion (A):** The key concept of data structure is to manage the storage of data in the memory efficiently. **Reason (R):** The data structure is a way to create a logical structure in the memory so that the storage of numerous data values could be managed using minimum space. It helps in a fast accessing of data during execution of a program.	1
18.	**Assertion(A):** Every open file maintains a file-pointer and keeps track of its position after every operation. **Reason (R):** Every read and write operation takes place at the current position of the file pointer.	1
SECTION B		
19.	Give two advantages and two disadvantages of star topology **OR** Define the following terms: **www**, **web hosting**	2
20.	What will be the flow of execution of the following code? 1 #function definition 2 def Increment(X): 3 X += 1 4 X = 3 5 print(X) 6 Increment(X) 7 print(X)	2
21.	Explain the Scope of a variable in Python with example. **OR** Differentiate between actual parameter(s) and formal parameter(s) with a suitable example for each	2
22.	Write a function Name(N) in Python, that accepts a list, N, of names and display the names starting with letter 'A'. For example, if the list is N = ['Ashima', 'Neha', 'Rahul', 'Ishaan', 'Ashu', 'Kirti'] Then the output should be: Ashima Ashu OR Write definition of a method SumEvenOdd(K) to display the sum of Odd and Even values separately from the list K. For example, if list K is defined as: K = [14,25,16,23,12,9,7,23] Then the output should be: Sum of Even numbers:42	2

	Sum of Odd numbers:87	
23.	Categorize following commands into DDL and DML commands? **INSERT INTO, DROP TABLE, ALTER TABLE,UPDATE...SET**	2
24.	Differentiate between char(n) and varchar(n) data types with respect of databases.	2

25.	Predict the Output for the following code:
	x = [1,2,3,4,5,6,7,8,9]
	a=[]
	n=len(x)
	for i in range(n):
	  if x[i]%2 == 0:
	    a.append(x[i]/2)
	  else:
	    a.append(x[i]*2)
	print("New List is: ",a)
	
	               OR
	Predict the output for the following code:
	L1 = [10,20,30]
	L2 = [110, 220, 330]
	L3 = L1+L2
	L4 = L3[0:4]
	print(L4)
	L4[0] = L4[0]*10
	L4[2] = L4[1]*5
	L4[1] = L4[2]
	L4[3] = L4[3] - 10
	print(L4)
		2

SECTION C

26.	Charu has to create a database named **MYEARTH** in MYSQL. She now needs to create a table named **CITY** in the database to storethe records of various cities across the globe. The table **CITY** has the following structure: **Table: CITY** <table><tr><td>**FIELD NAME**</td><td>**DATA TYPE**</td><td>**REMARKS**</td></tr><tr><td>CityCode</td><td>CHAR(5)</td><td>Primary Key</td></tr><tr><td>CityName</td><td>VARCHAR(20)</td><td></td></tr><tr><td>Size</td><td>Integer</td><td></td></tr><tr><td>AvgTemp</td><td>Integer</td><td></td></tr><tr><td>PollutionRate</td><td>Integer</td><td></td></tr><tr><td>Population</td><td>Integer</td><td></td></tr></table>	3
27.	Write a function in Python with function call to count the number of lines in a text file 'Detail.txt' which is starting with alphabet 'T'. OR Write a function in Python with function call to read the text file "Data.txt" and count the number of times 'my' occurs in the file.	3
28.	a. What is meant by pickling and unpickling of files in Python? b. Difference between r+ and w+ modes of text files?	1+1+1

	c. Name the modules required for working on text files, binary files and csv files in Python.	
29.	1. Expand the following: SMTP, XML 2. Out of the following, which is the fastest wired and wireless medium of transmission? **Infrared, coaxial cable, optical fibre,microwave, Ethernet cable** 3. How is packet switching different from circuit switching?	1+1+1
30.	Write a program in Python to implement a stack for these book details: (bookno, bookname), i.e. Each node of the stack should contain two information about a book, book number and book name. Also provide the option for user if he/she wants to view all records of stack or only last added record.	3
	SECTION D	
31.	Ashok is a Python programmer who has written a code and created a binary file 'emp.dat' with employee id, name and salary. The file contains 10 records. He wants to update a record based on the employee id entered by user and update the salary. The updated record is then to be written in the file 'temp.dat' along with the records which are not to be updated. An appropriate message is displayed if employee id is not found. As a programmer, help him to complete the following code:	4

```
import _____                      #Statement 1
def update_data():
    rec={}
    f = open ("emp.dat", "rb")
    t = open ("_____")            #Statement 2
    found = false
    emp_id = int(input("Enter employee id to update record : "))
    while True:
    try:
        rec = _____            #Statement 3
        if rec ["Employee_id"] == emp_id:
            found= True
            rec["Salary"] = int(input("Enter new Salary:"))
            pickle._____          #Statement 4
         else:
            pickle.dump(rec,t)
    except:
        break
if found == True:
    print("The salary is updated.")
else:
    print("Employee id not found!!")
f.close()
t.close()
```

1. Which module should be imported in the program? **(Statement 1)**
2. Write the correct statement required to open a temporary file named 'temp.dat'. **(Statement 2)**
3. Which statement should Ashok fill in **Statement 3** to read the data from the binary file?
4. Write appropriate code to update data in the file. **(Statement 4)**

32.	Write a program in Python to get student details (Rollno, Name and marks) for multiple students from the user and create a CSV file by writing all the student details in one go. Also read and display the data of CSV file.		4

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SECTION E

</div>

33.	Happy Faces Corporation has set up its new centre at Noida, Uttar Pradesh for its office and web-based activities. It has 4 blocks ofbuildings.		5

Happy Faces Corporation

Block A

Block B

Block C

Block D

Distance between the various blocks is as follows:A to B   40 m

B to C	120m
C to D	100m
A to D	170m
B to D	150m
A to C	70m

Numbers of computers in each block
Block A -25
Block B - 50
Block C - 125
Block D - 10

   a. Suggest and draw the cable layout to efficiently connectvarious blocks of buildings within the Noida centre for connecting the digital devices.
   b. Which block will be best suitable to place the server and why?
   c. Suggest the placement of the following device withjustification
      a.   Repeater   b. Hub/Switch
   d. Which kind of network (PAN/LAN/WAN) will be formed if theNoida office is connected to its head office in Mumbai?
   e. Which fast and very effective wireless transmission mediumshould preferably be used to connect the head office at Mumbai with the centre at Noida?

34.	Read the following passage and answer the questions that follow:
	Lists are the container which store the heterogeneous elements of any type as integer, character, floating that store in square brackets [].
	Consider the following list:
	T = [4,7,[2,5.7,9.6], 'Delhi', 'Mumbai', 'Kolkata']
	  1. To print Value 9.6, the correct python statement will be:
	    a. L [2][2] b. L [2][-1] c. L [-4][-1] d. All of the above
	  2. The length of L is:
			5

a. 6   b. 8   c. 18   d. None of these
3. The output for statement len(L[1]) will be:
    a. 1   b. 3   c. Exception   d. Syntax Error
4. print(L[:2] will generate value:
    a. [4]   b. [4,7]   c. [4,7,[2,5.7,9.6]]   d. Error
5. L.append[4,5,6] will generate output:
    a. Error
    b. Append a sublist [4,5,6] into L
    c. Append three elements in list 4, 5 and 6
    d. None of these

OR

Read the following passage and answer the questions that follows:
Lists are the container which store the heterogeneous elements of any type like integer, character or floating point that store in square brackets[].
Consider the following list for Python:
D = ["Raja", 4.87, 'Delhi', 'Kerala', [23, 7.56, 'Neha'], 98]
What will the following statements do as per above definition of D:
1. D [4][-3]
2. len(D[3])
3. d [2] = 54
4. print (D[0] + D[1])
5. print (D[1:5:3]

| 35. | Ami has joined as teaching assistant. She is working with data files using Python. She is currently working on the following incomplete code:
Color= ['Red', 'Orange', 'Crimson', 'Magenta', 'Fuschia', 'Blue', 'Black']
def LenColors(_____,_____):   #Statement 1
　　with _____: #Statement 2
　　　　for c in Color:
　　　　　　_____: #Statement 3
　　　　　　_____   #Statement 4
Fname ='Colors.txt'
N = int(input("Enter a number (between 3 to 7): "))
_____   #Statement 5
FILE = open(Fname)
print(File.read())

Help her complete the code as per instruction given below:
　a. Complete **Statement 1** and **Statement 5** so that Statement 5 invokes the function LenColors() by passing arguments—the filename and the integer value n.
　b. **Statement 2**: Open the file for writing using a with statement in the file object namely F.
　c. Inside the loop, write code so that only those colors from the color list get written in separate lines on the file that have word length more than n(the second parameter received) **(Statement 3 and Statement 4)**
　d. What will be the output produced, if the value of n is entered as 6?
OR | 5 |

Atif won a junior programming contest and as a prize, he is attending a Python workshop. In one of his assignments, he has been given a text file namely *Demo.txt* as shown below:

The total turnover of the bamboo sector in the state has increased from the base levels of Rs 27.90 crores in 2006-07.
The turnover was 83.7 crore during the FY 2015-16 which has increased to over Rs. 93.53 cr during 2016-17.
#tripura #bamboo #mission
tripura@government.gov

Atif has been asked to complete the following code as per the instructions below:

```
F = _____                          #Statement 1
Ch = " "        #initially stored a space
Dcount = 0
Ccount = 0
While Ch:
        _____              #Statement 2
    If _____ :             #Statement 3
        _____              #Statement 4
        _____ :                    #Statement 5
        _____                      #Stataement 6
print("Count 1: ",Dcount)
print("Count 2: ",Ccount)
F.close()
```

Help him complete the code as per instruction given below:

a. Complete Statement 1 so that the given file is opened for reading.

b. Complete Statement 2 so that one character is read from the open file into the variable Ch.

c. Complete code for Statement 3 and Statement 4 so that it counts number of digits in the file, and stores the count in the variable Dcount.

d. Complete code for Statement 5 and Statement 6 so that it counts number of these special characters '@','#' and '-', in the variable Ccount.

After completing code, what will be the output of produced by the code

CLASS: XII SESSION: 2023-24

COMPUTER SCIENCE (083)

PRACTICE SET

Time allowed: 3 Hours   *Maximum Marks: 70*

General Instructions:

- Please check this question paper contains 35 questions.
- The paper is divided into 5 Sections- A, B, C, D and E.
- Section A, consists of 18 questions (1 to 18). Each question carries 1 Mark.
- Section B, consists of 7 questions (19 to 25). Each question carries 2 Marks.
- Section C, consists of 5 questions (26 to 30). Each question carries 3 Marks.
- Section D, consists of 2 questions (31 to 32). Each question carries 4 Marks.
- Section E, consists of 3 questions (33 to 35). Each question carries 5 Marks.
- All programming questions are to be answered using Python Language only.

Q No	Question	Marks
	Section A	
1	State True or False: CSV file is also known as delimited text file which can be opened in Notepad and Spreadsheet both.	1
2	The query to display all the tables stored in a database is: a. Display Tables; b. Show Tables; c. All Tables; d. Show tables in <database name>;	1
3	Consider the following expression: True or not False and False and not True Which of the following will be correct output if the given expression is evaluated? True b. False c. None d. Null	1
4	_____ function splits the given string based on delimiter and store the result in the form of list. partition() b. split() c. divide() d. clear()	1
5	In a table there can be more than one attribute which contains unique values. These columns are known as _____ Primary Key b. Alternate Key c. Candidate Key	1
6	A device that amplifies a signal being transmitted on the network is known as:	1

	Modem b. Repeater c. Hub d. Switch	
7	Write the output of the code given below: dict = {"stname": "Ajay", "age": 17} dict['age'] = 27 dict['address'] = "Bikaner" print(dict)	1
8	Find the output of the following code number= [1,5,7,0,4] print(number[2:3]) (a) [5] (b) [7] (c) [7,0] (d) None of above	1
9	What is output of following code segment T= min(1,6,0,-3,100) (a) 1 (b) -3 (c) 0 (d) None of above	1
10	What is the purpose of the random module? a.) To generate random numbers for cryptography. b.) To generate random numbers for statistical analysis c.) To generate random numbers for various applications. To generate truly random numbers for secure applications.	1
11	The internet facility that facilitates remote login is: HTTP b. FTP c. TELNET d. LAN	1
12	A _____ is a block of organized and reusable code. a. Parameter b. Argument c. Definition d. Function	1
13	When will the else part of try-except-else be executed? a. Always b. When an exception occurs c. When no exception occurs When an exception occurs in to except block	1
14	Which of the following is not an aggregate function? AVG b. MAX c. JOIN d. COUNT	1
15	Which of the following transmission media has the highest bandwidth? a. Co-axial cable b. Fiber optic cable c. Twisted pair cable d. None of these	1

16	Which of the following function is used with the csv modules in Python to read the content of a csv file into an object? readrow() b. readrows() c. reader() d. load()	1
	Q17 and 18 are ASSERTION (A) and REASONING (R) based questions. Mark the correct choice as (a) Both A and R are true and R is the correct explanation for A (b) Both A and R are true and R is not the correct explanation for A (c) A is True but R is False. A is false but R is True	
17	**Assertion:** The order of execution of the statements in a program is known as flow of control. **Reason:** The flow of control can be implemented using control structures.	1
18	**Assertion:** Keyword arguments are related to the function calls. **Reason:** When you use keyword arguments in a function call, the caller identifies the arguments by the parameter name.	1
Section B	
19	Name the protocol: 1. Used to transfer voice using packet switched network. Used for chatting between two groups or between two individuals	2

20	What will be the output of the following code?
	def Func1(x):
	    try:
	        print(5/x)
	    except:
	        print("Error…")
		2

21	What is the difference between parameters and arguments?	2
22	Define Stack. Give any two applications of Stacks	2
23	Write a Python function that takes two lists and returns True if they have at least one common member.	2
24	Write the code in Python to create a table Student in database School with following fields:	2

25	What will be the output of the following program?
	  a. def INCREASE(x):
	        a = a + x
	        return
	    a = 15
		2

For Q24, the table of fields:

Fields	Datatype
Student_id	varchar(6)
S_name	varchar(20)
Class	int(4)
Section	char(2)

```
        b = 10
        increase(b)
        print(a)


   b.  z = 1
        def FUNC():
            z = 10
        print(z)
```

Section C		

26	How can we import a module in Python? What are the possible outcomes(s) executed from the following code? Also specify the maximum and minimum values that can be assigned to variable FLOWER.
	FLOWER = random.randint(0,3)
	NAME = ["Rose", "Lily", "Tulip", "Marigold"]
	for x in NAME:
	    for y in range (1, FLOWER):
	        print(x, end= " ")
	    print()
		3

27	Write the output of the queries (a) to (c) based on the table, Furniture given below. 	FID	Name	Dt_of_Purchase	Cost	Disc.
---	---	---	---	---
B001	Double Bed	03-Jan-2018	45000	10
T010	Dinning Tabel	10-Mar-2020	51000	5
B004	Single Bed	19-Jul-2016	22000	0
C003	Long Back Chair	30-Dec-2016	12000	3
T006	Console Table	17-Nov-2019	15000	12

B006	Bunk Bed	01-Jan-2021	28000	14	
					
					i.) SELECT SUM(DISCOUNT) FROM FURNITURE WHERE COST > 15000;
					ii.) SELECT MAX(Dt_of_Purchase) FROM FURNITURE;
					iii.) SELECT * FROM FURNITURE WHERE DISCOUNT > 5 AND FID LIKE "T%";
						3

28	Write a program that uses a function which takes to string arguments and returns the string comparison result of the two passed strings.	3
29	Consider the table Personal given below: 	P_ID	Name	Desig	Salary	Allowance
---	---	---	---	---
P01	Rohit	Manager	89000	4800
P02	Kashish	Clerk	NULL	NULL
P03	Mahesh	Supervisor	48000	NULL		3

| P04 | Salil | Clerk | 31000 | 1900 |
| P05 | Ravina | Supervisor | NULl | 2100 |

Based on the given table, write SQL queries for the following:

    a. Increase the salary by 10% of persons whose allowance is given.

    b. Display Name and Total salary (sun of salary and allowance) of all persons. The column heading 'TOTAL SALARY' should also be displayed.

    c. Delete the record of Supervisors who have salary greater than 25000.

| 30 | A list, NList, contains following record as list elements: | 3 |

[City, Country, distance from Delhi]

Each of these records are nested together to form a nested list. Write the following user defined functions in Python to perform the specified operations on the stack named travel.

    i.   **Push_element(NList):** It takes the nested list as an argument and pushes a list object containing name of the city and country, which are not in India and distance is less than 3500 km from Delhi.

    ii.   **Pop_element():** It pops the objects from the stack and displays them. Also, the

        function should display "Stack Empty" when there are no elements in the stack.

Section D

| 31 | Anmol maintain that database of medicines for his pharmacy using SQL to store the data. | 4 |

The structure of the table PHARMA for the purpose is as follows:

- Name of the table-PHARMA
- The attributes of PHARMA are as follows:

    MID - numeric
    MNAME - character of size 20
    PRICE - numeric
    UNITS - numeric
    EXPIRY – date

Table: PHARMA

MID	MNAME	PRICE	UNITS	EXPIRY
M1	PARACETAMOL	12	120	2022-12-25
M2	CETRIZINE	6	125	2022-10-12

MID	MNAME			
M3	METFORMIN	14	150	2022-05-23
M4	VITAMIN B-6	12	120	2022-07-01
M5	VITAMIN D3	25	150	2022-06-30
M6	TELMISARTAN	22	115	2022-02-25

(a) Identify the attribute best suitable to be declared as a primary key.

(b) Anmol has received a new medicine to be added into his stock, but for which he does not know the number of UNITS. So, he decides to add the medicine without its value for UNITS. The rest of the values are as follows:

MID	MNAME	PRICE	EXPIRY
M7	SUCRALFATE	17	2022-03-20

Write the SQL command which Anmol should execute to perform the required task.

(c) Anmol wants to change the name of the attribute UNITS to QUANTITY in the table PHARMA. Which of the following commands will he use for the purpose?

    I.   UPDATE
   II.   DROP TABLE
  III.   CREATE TABLE
  IV.   ALTER TABLE

(d) Now Anmol wants to increase the PRICE of all medicines following commands will he use for the purpose?

32	Write a program in Python to get student details (Rollno, Name and marks) for multiple students from the user and create a CSV file by writing all the student details in one go. Also read and display the data of CSV file.	4

	Section E	
33	VishInternational Inc. is planning to connect its Bengaluru office setup with its Head Office inDelhi. The Bengaluru Office G.R.K. International Inc. is spread across an area of approx. 1 Square Killometer, consisting of 3 blocks : Human Resource, Academic and Administration. You as a network expert have to suggest answers to the five quaries (i) to (v) raised by them.	5

Mumbai Head Office

DELHI HEAD OFFICE

Human Resources

Academics   **Administration**

Shortest distances between various Blocks :

Human Resources to Administration	200 m
Human Resources to Academics	60 m
Academics to Administration	150 m
Delhi Head Office to Bangaluru office Setup	2000 km

The Number of Computers installed at various blocks are as follows:

BLOCK	No. of Computers
Human Resources	55
Administration	60
Academics	200
Delhi Head Office	30

(i) Suggest the network type (out of LAN, MAN, WAN) for connecting each of the followingset of their Offices:
Mumbai Head office and Administration Office
Human Resources Office and Academics office
ii) Which device will you suggest to be procured by the company for connecting all thecomputers within each of their offices out of the following devices?
MODEM   (b) Switch/Hub   (c) Repeater
iii) Suggest a cable /wiring layout among the various blocks within the Delhi OfficeSetup for connecting the Blocks.
iv) Suggest the most suitable in the Delhi Office Setup, to host the Server. Give a suitablereason with your suggestion.
v) Suggest the most suitable media to provide secure, fast and reliable data connectivity between Mumbai Head Office and the Delhi Office

	Setup.	
34	Write any two differences between text and binary files. Write a program in python with function **LineRead()**, which reads the contents of a text file "***Memory.txt***" and displays those lines from the file which have at least 10 words in it. ***For example, if the content of "Memory.txt" is as follows:*** Five cows lived in a little forest. They ate fresh grass in a large green meadow. They were kind friends. They decided to do everything together, so the lions couldn't attack them for food. One day, five cows fought and each one started to eat grass in a different place. The lions decided to seize the opportunity and killed them one by one. ***Then the output should be,*** They decided to do everything together, so the lions couldn't attack them for food. One day, five cows fought and each one started to eat grass in a different place. The lions decided to seize the opportunity and killed them one by one. OR Can a function return multiple values? If yes then explain with suitable example. A Binary file ***Book.dat*** has structure [BookNo, BookName, Author]. 1. Write a user defined function FileData() to input data for a record and add to book.dat. Write a function CountData(Author) in Python which accepts the AuthorName as parameter and count and return number of books by the given author are stored in the binary file ***Book.dat***.	5
35	Consider the following DEPT and EMPLOYEE tables. **Table: DEPT** 	D_CODE	D_NAME	CITY
D001	INFRASTRUCTURE	DELHI
D002	MARKETING	DELHI
D003	MEDIA	MUMBAI
D005	FINANCE	KOLKATA
D004	HUMAN RESOURCE	MUMBAI		5

Table: EMPLOYEE

E_NO	NAME	DOJ	DOB	GENDER	D_CODE	AGE
1001	Vinay	2013-09-02	1991-09-01	MALE	D001	25
1002	Ruby	2012-12-11	1990-12-15	FEMALE	D003	27
1003	Anuj	2013-02-03	1987-09-04	MALE	D005	24
1007	Sunny	2014-01-17	1988-10-19	MALE	D004	25
1004	Rohit	2012-12-09	1986-11-14	MALE	D001	27
1005	Preeti	2013-11-18	1989-03-31	FEMALE	D002	NULL

Note: DOJ refers to date of joining and DOB refers to date of Birth of employees.

Write SQL queries for the following:

a. To display D_NAME and CITY from table DEPT where D_NAME ends with letter 'G' and CITY is 'DELHI'.
b. To delete data of all those employees whose age is less than 25.
c. To update AGE to 23 of those employee whose E_NO is 1004.
d. To change the sequence of DOB column in employee table and move it before DOJ

   column.
e. To add a new column MOBILE int(20) before column AGE in employee table.