# ENGINEERING GRAPHICS (Code No. 046) COURSE STRUCTURE CLASS XII (2022-23)

#### **THEORY**

## **Unit I: Isometric Projection of Solids**

- (i) Construction of isometric scale showing main divisions of 10mm and smaller divisions of 1mm, also showing the leading angles. Drawing helping view/s such as triangles, pentagon, hexagon, etc., using isometric scale.
- (ii) Isometric projection (drawn to isometric scale) of solids such as cube; regular prisms and pyramids (triangular, square, pentagonal and hexagonal); cone; cylinder; sphere; hemisphere. The axis and the base side of the solid should be either perpendicular to HP / VP or parallel to HP and VP. (Indicate the direction of viewing).
- (iii) Combination of any two above mentioned solids keeping the base side parallel or perpendicular to HP/VP and placed centrally together (Axis of both the solids should not be given parallel to HP).

**Note:** Hidden lines are not required in isometric projection.

### Unit II: Machine Drawing (as per SP46: 2003)

### A. Drawing of machine parts

(i) Drawing to full size scale with instruments.

(Internal choice will be given between any two of the following).

Introduction of threads: Standard profiles of screw threads - Square, Knuckle, B.S.W., Metric (external and internal); Bolts - Square head, Hexagonal head; Nuts - Square head, Hexagonal head; Plain washer; combination of nut and bolt with or without washer for assembling two parts together.

#### (ii) Free-hand sketches

(Internal choice will be given between any two of the following).

Conventional representation of external and internal threads; Types of studs – Plain stud, Square-neck stud, Collar stud; Types of rivets – Snap head, Pan head (without tapered neck), Flat head,  $60^{\circ}$  countersunk flat head.

NOTE: Completion of the Mid-Term syllabus by 30<sup>th</sup> September 2022.

**MID-TERM EXAMINATION** 

#### **THEORY**

# **Unit I: Isometric Projection of Solids**

- (iv) Construction of isometric scale showing main divisions of 10mm and smaller divisions of 1mm, also showing the leading angles. Drawing helping view/s such as triangles, pentagon, hexagon, etc., using isometric scale.
- (v) Isometric projection (drawn to isometric scale) of solids such as cube; regular prisms and pyramids (triangular, square, pentagonal and hexagonal); cone; cylinder; sphere; hemisphere. The axis and the base side of the solid should be either perpendicular to HP / VP or parallel to HP and VP. (Indicate the direction of viewing).
- (vi) Combination of any two above mentioned solids keeping the base side parallel or perpendicular to HP/VP and placed centrally together (Axis of both the solids should not be given parallel to HP).

**Note:** Hidden lines are not required in isometric projection.

# Unit II: Machine Drawing (as per SP46: 2003)

# A. Drawing of machine parts

(i) Drawing to full size scale with instruments.

(Internal choice will be given between any two of the following).

Introduction of threads: Standard profiles of screw threads - Square, Knuckle, B.S.W., Metric (external and internal); Bolts - Square head, Hexagonal head; Nuts - Square head, Hexagonal head; Plain washer; combination of nut and bolt with or without washer for assembling two parts together.

### (ii) Free-hand sketches

(Internal choice will be given between any two of the following).

Conventional representation of external and internal threads; Types of studs – Plain stud, Square-neck stud, Collar stud; Types of rivets – Snap head, Pan head (without tapered neck), Flat head,  $60^{\circ}$  countersunk flat head.

### B. Assembly drawings and Dis-Assembly drawings

(Internal choice will be given between an Assembly drawing and a Dis-Assembly drawing).

- 1. Bearings
  - (i) Open-Bearing
  - (ii) Bush-Bearing
- 2. Rod-Joints
  - (i) Cotter-joints for round-rods (Sleeve and cotter joint)
  - (ii) Cotter-joints for square rods (Gib and cotter-joint)
- 3. Tie-rod and Pipe-joint
  - (i) Turnbuckle
  - (ii) Flange pipe joint

### Note:

- 1. In all Assembly drawings, half sectional front view will be asked. Side/End view or Top View/Plan will be drawn without section.
- 2. In all Dis-assembly drawings, only two orthographic views (one of the two views may be half in section or full in section) will be asked of any two parts only.
- 3. (a) In all sectional views, hidden lines/edges are not to be shown.
  - (b) In all full views, hidden/edges are to be shown.

One Paper (Theory): 3 Hours
One paper (Practical): 3 Hours

70 Marks

30 Marks

S.No.	Unit Name	Marks
1	Isometric Projections of Solids	25
II	Machine Drawing	45
	A. Drawing of Machine parts	
	B. Assembly Drawing and Dis-assembly drawings	
	1. Bearings	
	2. Rod joints	
	3. Tie-rod and Pipe joint	
	Practical	30
	Total Marks	100

#### Note:

- Complete the Annual syllabus by 15<sup>th</sup> December 2022.
- Whole syllabus (excluding deleted part ) will be covered in Common Annual School Examinations.

#### **PRACTICALS**

(i) To perform the following tasks (for One only) from the given views of the prescribed ten machine blocks in **ANNEXURE-I**.

### Value-Points

1.	Copy the given views	1
2.	Drawing the missing view with hidden lines	2
3.	Sketching the Isometric view without hidden edges	5
4.	To make the machine block of the above in three dimensions.	
	(not to scale but approximately proportionately drawn with	
	any medium i.e. thermocol, soap-cake, plasticine, clay, wax,	
	orchsis (available with florists), etc.	7

(ii) Computer Aided Design (CAD) - Project

10

3

2

Project file to be submitted on the simple solids (Prism, Pyramids and Frustums of equilateral triangle, square, pentagon and hexagon) or machine blocks as prescribed in part-I by using the CAD software.

(iii) (a) Sessional work relating to machine blocks as prescribed.

(b) Viva-voce based on part-I and part-II

Total Marks 30

### **ACTIVITY**

Industrial Visits (Two) to any industry/ manufacturing plant to acquaint the students with the present - day methods & technology for better conceptual understanding can be done by <u>virtual tour of the factory/plant</u>. The following links are given as an example for same:

**Bolt Making Machine Manufacturer** 

https://www.youtube.com/watch?v=ARS87trb4u4

Machine Tools Manufacturing Process -2

https://www.youtube.com/watch?v=vlZjTEkGbN8

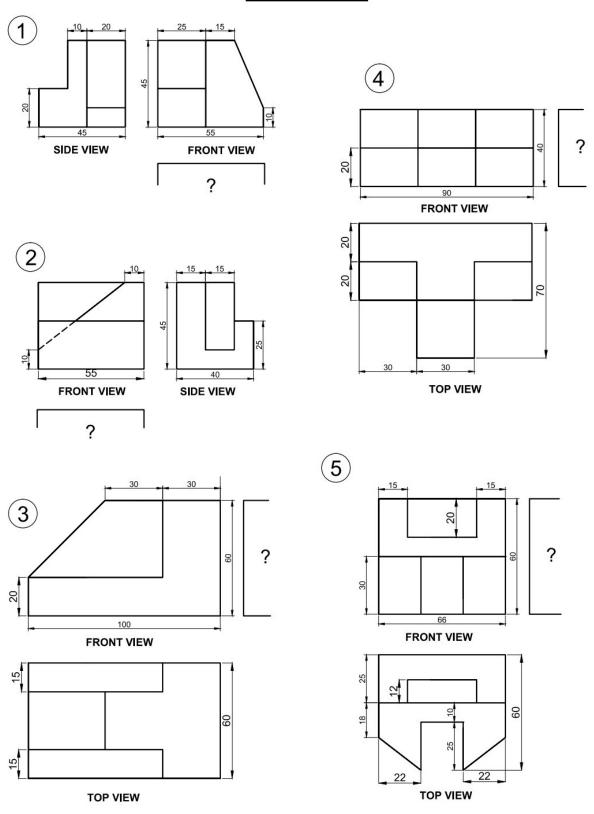
**BMW Engine Factory** 

https://www.youtube.com/watch?v=0z6E 1KonbA

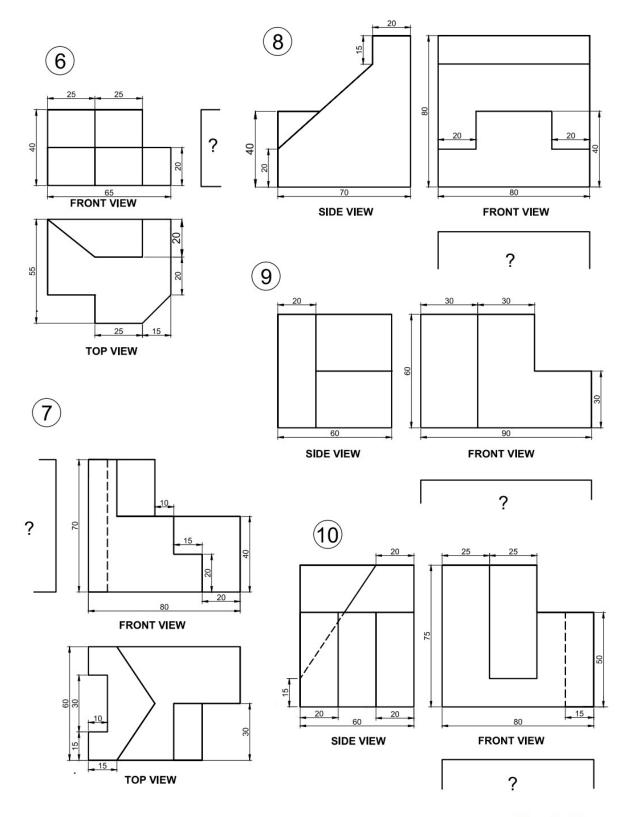
Hydroelectric Virtual Plant Tour

https://youtu.be/Ki8kSB1ThJQ

# ANNEXURE -- 1



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