ENGINEERING GRAPHICS (Code No. 046)

CLASS - XII

The subject of 'Engineering Graphics' has become an indispensable tool for Engineers, Technocrats, Architects, Draftsmen, Surveyors, Designers and many other professionals in the recent times. It is used to convey the ideas and information necessary for the construction or analysis of machines, structures and system, graphically. It is expected that the knowledge gained through the study of different topics and the Skills acquired through the prescribed practical work will make the learners to meet the challenges of academic, professional courses and daily life situations after studying the subject at Senior Secondary Stage.

Objectives:

The study of the subject of Engineering Graphics at Senior School Level aims at helping the learner to:

- develop clear concept and perception of different objects.
- develop a clear understanding of plane geometry, solid geometry and machine drawing so as to apply the same in relevant practical fields such as technology and industry.
- develop the skill of expressing two-dimensional and three-dimensional objects into professional language and vice versa.
- acquire speed and accuracy in use of drawing instruments.
- acquire the ability to readily draw neat sketches, often needed in "On-job situations".
- use technology (CAD) in developing isometric and orthographic projections of simple objects.

COURSE STRUCTURE
CLASS XII (2019-20)

One Paper (Theory) : 3 Hours 70 Marks
One paper (Practical) : 3 Hours 30 Marks

S.No.	Unit Name	Marks	Periods
I	Isometric Projections of Solids	25	50
II	**Machine Drawing** A. Drawing of Machine parts B. Assembly Drawing and Dis-assembly drawings 1. Bearings 2. Rod joints 3. Tie-rod and pipe joints 4. Couplings 5. Pulleys	45	118
	Practical	30	72
	Total Marks	**100**	**240**

THEORY

Unit I: Isometric Projection of Solids **50 Periods**

(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 prism and pyramids (triangular, square, pentagonal and hexagonal), cone, cylinder, sphere, hemi- sphere, frustum of right regular pyramids (triangular, square, pentagonal, hexagonal) and cone, when they are cut by a plane parallel to the base. 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 two solids (except "frustum" of Pyramids and Cone) 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: (1) Question on frustum will be asked in vertical position only.
(2) Hidden lines are not required in isometric projection.

Unit II: Machine Drawing (as per SP 46: 2003) **118 Periods**

A. Drawing of machine parts 36 Periods

(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, Hexagonal, Tee and Hook); Nuts (Square and Hexagonal); Plain washer, combination of nut and bolt with or without washer for assembling two parts together, Single riveted lap joint with standard dimensions.

(ii) Free-hand sketches

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

Conventional representation of external and internal threads; studs (plain, square-neck and collar); screws (round-head, cheese-head, 90^0 flat counter sunk-head, hexagonal socket head and grub-screw); Types of rivets:- snap head, pan head-without tapered neck, flat head and 60^0 countersunk flat head. Types of sunk-keys (rectangular taper, woodruff and double-head feather key with gib head on both ends).

Note: In the above mentioned machine parts (free hand sketches) "in-position" shall not be asked.

B. Assembly drawings and Dis-Assembly drawings (Internal choice will be given between an Assembly drawing and a Dis-Assembly drawing). 82 Periods

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 the Dis-assembly drawings, only two orthographic views (one of the two views may be half in section or full in section) of any two parts.
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.

   1. Bearings
      - (i) Open-Bearing
      - (ii) Bush- Bearing

   2. Rod-Joints
      - (i) Cotter-joints for circular-rods (socket and spigot joint)
      - (ii) Cotter-joints for round-rods (sleeve and cotter joint)

(iii) Cotter-joints for square rods (Gib and cotter-joint)

3. Tie-rod and Pipe-joint
   (i) Turnbuckle
   (ii) Flange pipe joint
4. Couplings (socket and spigot arrangement)
   (i) Unprotected Flange Coupling
   (ii) Protected Flange Coupling
5. Pulleys
   (i) Solid cast iron pulley – (up to 200 mm dia) having solid web

PRACTICALS

72 Periods

(i) To perform the following tasks from the given views of the prescribed machine block (One).

Value-Points

1. Copy the given views 1
2. Drawing the missing view without 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

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.

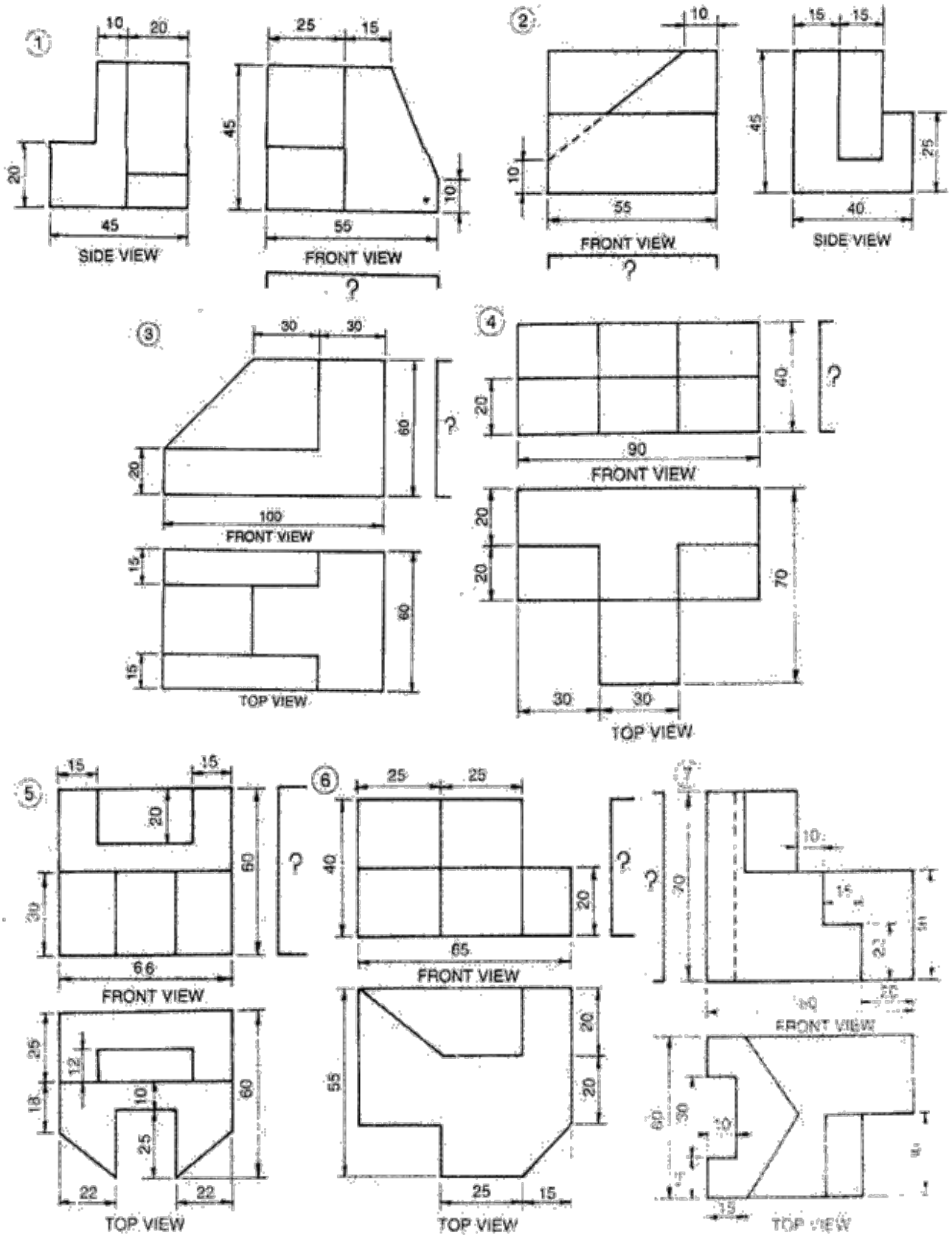
(iii) (i) Sessional work relating to machine blocks as prescribed. 3

(ii) Viva-voce based on part-I and part-II 2

Total Marks 30

ACTIVITY

Industrial Visit (Two) to any industry/ manufacturing & plant to acquaint the students with the presents with the present day methods & technology for better conceptual understating.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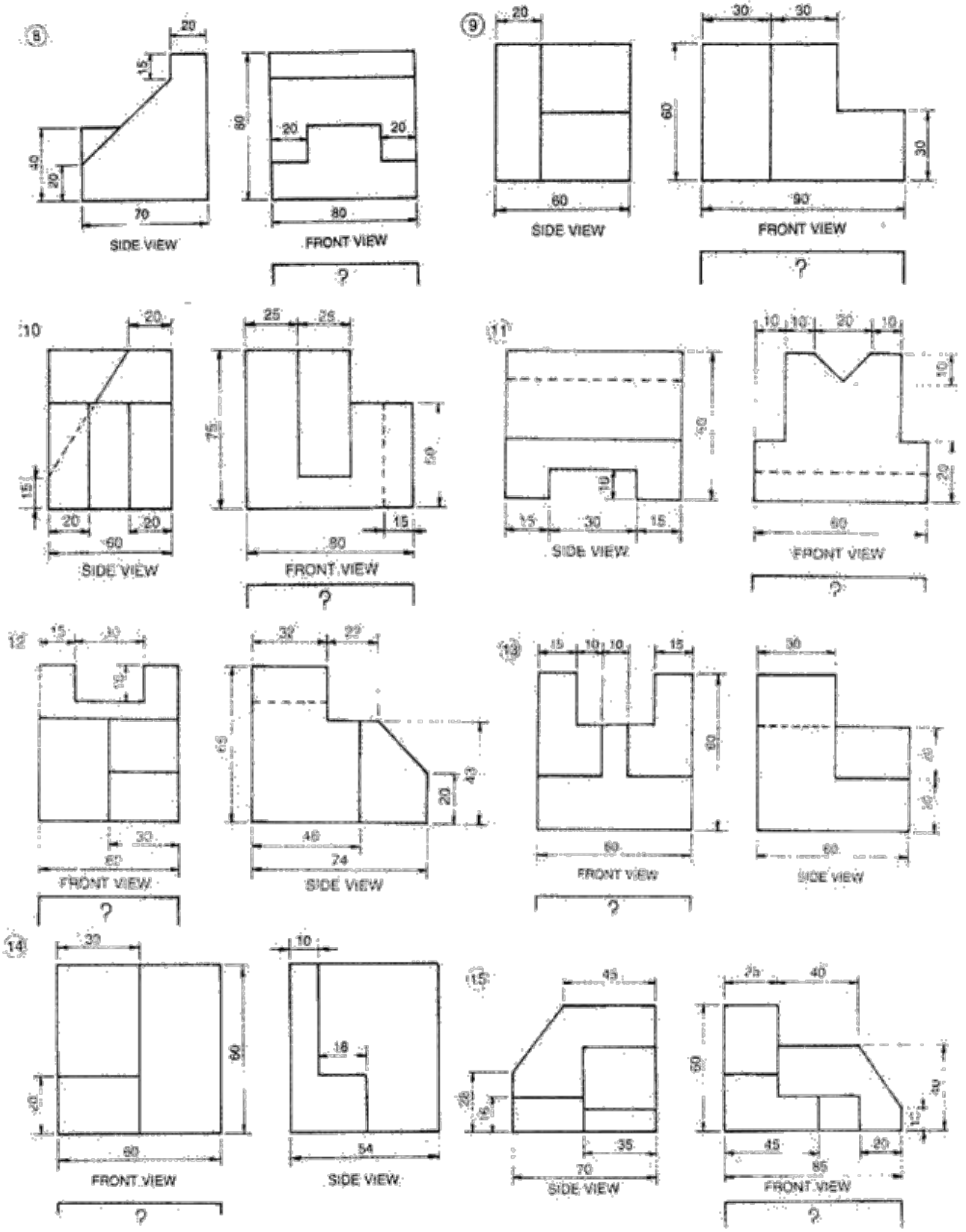
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