TECHNICAL DRAWING APPLICATIONS (65)

(Candidates offering Technical Drawing are not eligible to offer Technical Drawing Applications.)

Aims:

1. To develop competence among the students to pursue technical courses like Engineering, Architecture, Draftsmanship Surveying and other professional courses.

2. To understand basic principles of instrumental drawing drawn to scale and to acquire basic skills in the use of traditional drafting methods which would also be helpful in understanding computer aided designs.

3. To acquire the basic knowledge in their applications in various fields.

CLASS IX

*There will be one written paper of **three** hours duration carrying 100 marks and Internal Assessment of 100 marks.*

The paper will be divided into two sections, Section I and Section II.

Section I (40 marks) shall consist of compulsory short answer questions chosen from the entire syllabus.

Section II (60 marks) shall contain questions which require longer answers. There will be a choice of questions.

THEORY – 100 Marks

1. **Types of lines**
   (i) Border lines.
   (ii) Outlines.
   (iii) Dashed/ Dotted lines.
   (iv) Centre lines.
   (v) Extension lines or Projection lines.
   (vi) Dimension lines.
   (vii) Construction lines.
   (viii) Cutting-Plane lines.
   (ix) Section or Hatching lines.
   (x) Short break lines.
   (xi) Long break lines.

2. **Dimensioning**
   (i) Aligned system.
   (ii) Unidirectional System.

3. **Lettering and Numbering**

   Upright single stroke capitals as usually employed in engineering drawing.

4. **Sheet Layout**

   Basic.

5. **Geometrical Constructions**
   (a) Bisector of line segment.
   (b) Division of a line segment into required number of parts/ proportional parts.
   (c) Perpendicular and parallel lines.
   (d) Bisection of an angle, trisection of a right angle/ straight angle.
   (e) Congruent angle.
   (f) To find the centre of an arc.
   (g) Regular polygons up to six sides with simple methods using T-square and setsquares.

6. **Basic facility in Orthographic Projections**
   (a) Projection of points.
   (b) Projection of lines (in 1st quadrant/ 3rd quadrant / contained by reference plane)
      (i) line parallel to both the reference planes.
      (ii) line parallel to one of the reference planes and perpendicular to the other plane.
      (iii) line inclined to one of the reference planes and parallel to the other plane.

(iv) line inclined to both the reference planes.

(v) To find the true length of the line from the given projections.

(c) Projections of Surfaces/ Areas: such as regular polygons and circular lamina (1st angle and 3rd angle).

(i) surface perpendicular to both the reference planes.

(ii) surface perpendicular to one of the reference planes and parallel to the other.

(iii) Surface inclined to one of the surface planes and perpendicular to the other.

(iv) Conversion of simple pictorial views into orthographic views (1st angle / 3rd angle method) ELEVATION (F.V) PLAN (T.V.) END VIEW: LHS/RHS.

7. Isometric drawing

Copying the given isometric figure (simple and basic).

8. Free hand sketching

Tools and objects such as screwdriver, spanner, hammer, pliers, chisel, tri-square, calipers (internal and external) fountain pen, pair of scissors, pair of compasses, divider, knife, water tap etc.

PART II – INTERNAL ASSESSMENT

Minimum fifteen drawing assignments to be done during the year as assigned by the teacher.

CLASS X

*There will be one written paper of **three** hours duration carrying 100 marks and Internal Assessment of 100 marks.*

The paper will be divided into two sections, Section I and Section II

*Section I will consist of a number of questions covering Section A of the syllabus. The candidates are to attempt **three** questions out of **five**.*

*Section II will consist of questions covering Section B of the syllabus. The candidates are to attempt **two** questions out of **three**.*

THEORY – 100 Marks

SECTION A

1. **Geometrical Constructions based on Plane Geometry**

(i) Division of a line into equal or proportional parts: Construction of a triangle/ quadrilateral when its perimeter and the ratio of the lengths of its sides are given.

(ii) Division of a circle into equal parts (4, 6, 8, 12) using set square or compass.

(iii) To find the length of an arc/circumference of a circle.

(iv) An angle and a circle touching its sides.

(v) A circle of given radius passing through two given points.

(vi) An arc passing through three non-collinear points.

(vii) A continuous arc passing through not more than 5 non-collinear points.

(viii) A regular polygon (3, 4 5 6 sides) with special methods (side given).

(ix) Construction of a regular octagon in a square (side of the square = distance between parallel sides of a octagon).

(x) More than one polygon (sides 3, 4, 5, 6, 7, 8) on a common base on the same side/opposite sides.

(xi) Inscribing/Circumscribing a circle on a regular polygon (3, 4, 5, 6 sides).

(xii) Inscribe/Circumscribe a circle of given radius by a regular polygon up to six sides.

(xiii) In a regular polygon to draw the same number of equal circles as the sides of the polygon each circle touching one /two sides of the polygon and two of the other circles externally.

(xiv) Outside a regular polygon to draw the same number of equal circles as the sides of the polygon each touching one side of

the polygon and two of the other circles externally.

(xv) Regular hexagon and 3 equal circles inside it touching one side/ two sides of the hexagon and the other two circles externally.

(xvi) A circle and (3, 4, 5, 6,) equal circles inside it touching internally and touching each other externally.

(xvii) Tangents to a circle at a point on the circumference.

(xviii) Direct common tangents/Transverse common tangents to two equal/unequal circles. Also to measure and record their lengths.

(xix) Drawing (not more than three) circles touching each other externally and also touching two converging lines (radius of one of the circles is given).

2. Area constructions

(i) Constructions based on the application of area theorems (area of polygons).

(ii) Converting the given polygon into a triangle having equal/half/double the area of the polygon.

(iii) Changing given triangles (2 or 3) into a single triangle having the area equal to the sum of the areas of the given triangles.

3. Templates as an application of geometrical constructions and other constructions such as:

(i) Arc of a given radius touching a given line and passing through a given point.

(ii) Arc of given radius touching two intersecting straight lines.

(iii) Arc of given radius touching a given arc and a straight line.

(iv) Arc of a given radius touching two given arcs (externally/internally).

(To redraw the given figure and insert the dimensions).

4. Scales

(i) To find the R.F. (Representative Fraction) and the scale length from the given data by showing neat working.

(ii) Construction of a plain scale/diagonal scale.

(iii) Use of constructed scale in the preparation of field drawings/survey map (Enough data to be provided).

5. Engineering Curves (construction only) as used in manhole covers, arches, dams, monuments etc.

(i) Ellipse: (major and minor axes given)

(a) by arc of a circle method.

(b) by concentric circle method.

(c) by oblong method.

(ii) Parabola (base and axis given)

(a) by rectangle method.

(b) by tangent method.

6. Solids

Orthographic projections of right solids such as regular prisms and pyramids with bases as regular polygons up to six sides, cylinder and cone.

(i) Axis perpendicular to one of the reference planes and parallel to the other.

(a) Axis parallel to both the reference planes(prism/cylinder only).

(b) Axis inclined to one of the reference planes and parallel to the other. Use of auxiliary plane may be included.(Auxiliary elevation and auxiliary plan).

(ii) Development of surfaces of the solids (Parallel and Radial).

(iii) Determination of true length of line when inclined to both the reference planes e.g. slant edge of a pyramid.

7. Oblique drawing

Conversion of given orthographic views to oblique view (circular parts in top view to be excluded).

SECTION B

8. **Sections of right solids** (prism, pyramid, cylinder and cone)

   (i) Sectional views of cut solids with axis perpendicular to H.P. and parallel to V.P.

      (a) V.T. (Vertical Trace) parallel to or inclined to H.P.

      (b) H.T. (Horizontal Trace) parallel/inclined to V.P. (Figure showing V.T and H.T should be given) Questions based on word problems should be excluded.

   (ii) Axis parallel to both the reference planes (prism and cylinder only) with H.T .or V.T. of cutting plane shown in the figure.

   (iii) Development of lateral surfaces of cut solids (parallel, radial): Prism, Pyramid, cylinder, cone.

   (iv) Development of pipe joints as elbow joints, exhaust pipes etc. and the objects made of sheet metals in the shape of cylinders and cones.

   (v) True shape of a section.

   (vi) Auxiliary views (A.F.V. /A.T.V.) of cut solids with axis perpendicular to H.P and parallel to V.P with

      (a) Auxiliary plane parallel to the cutting plane.

      (b) Auxiliary plane inclined to H.P at a given angle θ.

9. **Isometric Drawing** (Use of scale to draw isometric drawing may be included. e.g. 2:1 or 1:2 only).

   (a) Copy the given isometric figure.

   (b) Conversion of the given orthographic view into isometric drawing.

   (c) Isometric projection by constructing and making use of an isometric scale.

10. **Sectional Orthographic views** (1st and 3rd angle methods)

    (a) Conversion of given pictorial view (Isometric/oblique into sectional/half sectional orthographic views).

    (b) Conversion of a given orthographic view into sectional/half sectional views and adding the missing view.

PART II- INTERNAL ASSESSMENT - 100 MARKS

1. To prepare a file containing minimum 15 drawing assignments.

2. To prepare a survey map.

3. To make at least 2 three dimensional models with stiff cartridge paper, chart paper or thermocol involving application of development of solids, true shape of section.

EVALUATION

The assignments/project work is to be evaluated by the subject teacher and by an External Examiner. The External Examiner may be a teacher nominated by the Principal, who could be from the faculty, **but not teaching the subject in the section/class.**

The Internal Examiner and the External Examiner will assess the assignments independently.

Award of marks (100 marks)

Subject Teacher (Internal Examiner): 50 marks
External Examiner: 50 marks

The total marks obtained out of 100 are to be sent to the Council by the Principal of the school.

The Head of the school will be responsible for the entry of the marks on the mark sheets provided by the Council.

INTERNAL ASSESSMENT IN TECHNICAL DRAWING APPLICATIONS - GUIDELINES FOR MARKING WITH GRADES

Criteria	Preparation	Analysis	Process	Results	Presentation
Grade I (4 marks)	Follows instructions (written, oral, diagrammatic) with understanding; modifies if needed. Familiarity with and safe use of apparatus, materials, techniques.	Analyses problem systematically. Recognises a number of variables and attempts to control them to build a logical plan of construction.	Comments upon, recognises use of instruments, degree of accuracy. Process is systematic.	Recognises and comments upon sources of error. Can deal with unexpected effects, suggesting modifications.	Presentation is accurate and good. Appropriate techniques are well used.
Grade II (3 marks)	Follows instructions to perform experiment with step-by-step operations. Awareness of safety. Familiarity with apparatus, materials and techniques.	Specifies sequence of operation; gives reasons for any change in procedure.	Makes relevant procedural modification. No assistance is needed for understanding steps of constructions.	Draws qualitative conclusions to proceed with construction.	Presentation is adequate. Appropriate techniques are used.
Grade III (2 marks)	Follows instructions to perform a single operation at a time. Safety awareness. Familiarity with apparatus & materials.	Develops simple development strategy. Trial and error modifications made to proceed with the construction.	Detailed instructions not given.	Draws obvious qualitative conclusions as required in the process.	Presentation is okay, but disorganised in some places. Overwriting; rough work is untidy.
Grade IV (1 mark)	Follows some instructions to perform a single practical operation. Casual about Safety. Manages to use apparatus & materials.	Struggles through the construction. Follows very simple techniques.	Tends to make mistakes in the following procedure.	Even when detailed format is provided, struggles or makes errors while processing the work.	Presentation is poor, disorganised but follows an acceptable sequence. Rough work missing or untidy.
Grade V (0 marks)	Not able to follow instructions or proceed with practical work without full assistance. Unaware of safety.	Cannot proceed with the development without help from time to time.	Even when format is given procedure is not understood.	Cannot process the work even with considerable help.	Presentation unacceptable; disorganised, untidy, poor. Rough work missing.