

TECHNICAL DRAWING - HIGHER LEVEL - PAPER I  
(Plane and Solid Geometry)

TUESDAY, 24 JUNE - MORNING, 9.30 to 12.30

(200 marks)

INSTRUCTIONS

Answer four questions.  
All questions carry equal marks.  
Construction lines must be shown on all solutions.  
Write the number of the question distinctly on the answer paper.  
All dimensions on the question paper are given in millimetres.  
First or third angle projection may be used.

1. Given the horizontal and vertical projections of two intersecting planes ABC and ABDE.

|   |   |     |   |    |   |     |
|---|---|-----|---|----|---|-----|
| A | = | 115 | - | 20 | - | 50  |
| B | = | 180 | - | 10 | - | 125 |
| C | = | 100 | - | 60 | - | 110 |
| D | = | 205 | - | 90 | - | 70  |
| E | = | 135 | - | 70 | - | 20  |

- Find the dihedral angle between the planes.
  - Draw the plan and elevation of the shortest horizontal line from C to the plane ABDE.
  - On a separate diagram draw the projections of the skew lines BC and DE and show the plan and elevation of the shortest distance between them.
2. In Fig. 1 the circle rolls along the line ABCD for one complete revolution.
- Draw the locus of the point P on the circle for this movement.
  - When the circle has rolled as far as position C an involute of the circle is unwound from P to C in a clockwise direction. On a separate diagram draw this portion of the involute.
  - If the involute is unwound while the circle is rolling from C to D, show the locus for the combined movement.

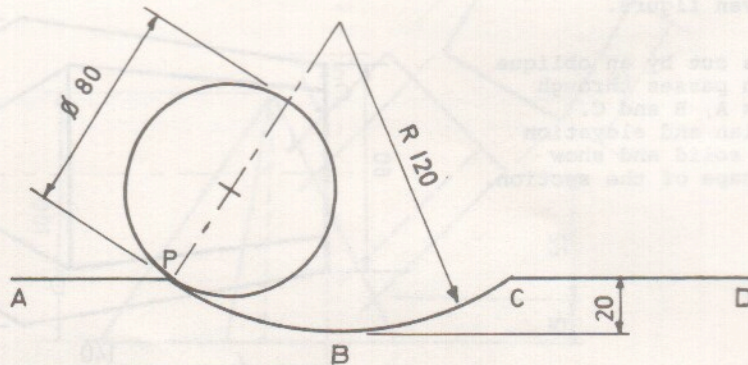


Fig 1.

3. Fig. 2 shows the plan of a regular tetrahedron whose edges are 100 mm long. The corner A rests on the horizontal plane and the corners B and C are 20 mm and 30 mm, respectively, above the horizontal plane.

- Draw an auxiliary elevation of the tetrahedron which shall show the inclination of the face ABC to the horizontal plane.
- Draw an elevation on an X-Y line parallel to AB.
- Draw the projections of the inscribed sphere.

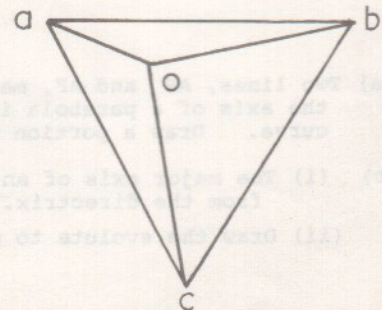


Fig. 2.

4. In Fig. 3 the pentagon ABCDE has a perimeter of 360 mm.

- (a) Draw the given figure.
- (b) On a separate diagram and without altering the side AB, convert the figure ABCDE to a triangle of equal area.
- (c) Join A to O and continue a line from O which shall divide the area of the figure ABCDE into two equal parts.

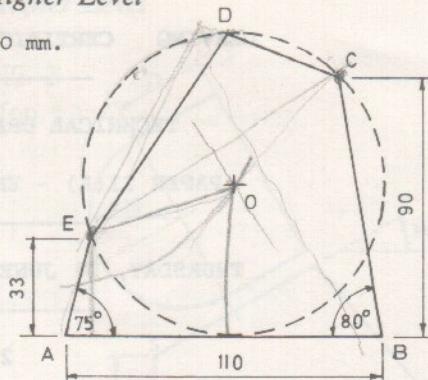


Fig. 3

5. Fig. 4 shows the incomplete projections of a square-based prism and an equilateral triangular prism which penetrate each other. Complete the projections of the solids showing all lines of interpenetration.

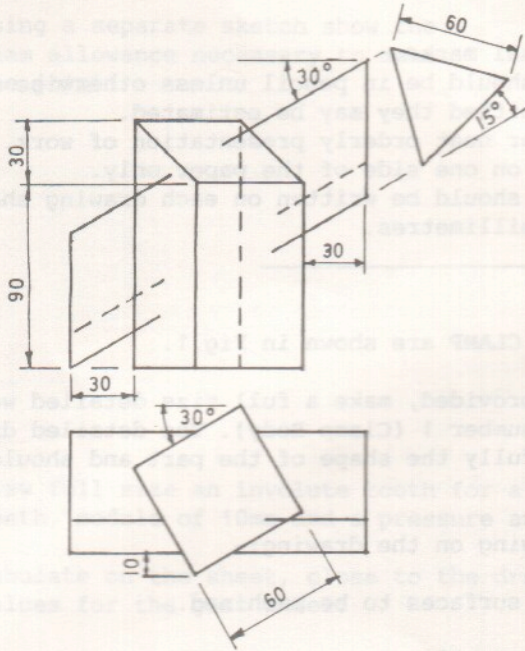


Fig. 4.

- 6. (a) The distance from the vertex to the directrix of a hyperbola is 29 mm and the eccentricity is 1.2. Draw a portion of the curve.
- (b) The distance between the focal points of a double hyperbola is 110 mm. A point on the curve is 38 mm and 130 mm, respectively, from the focal points.
  - (i) Find the transverse axis and draw the asymptotes.
  - (ii) If the radius of one of the focal spheres of the double cone for this hyperbola is 25 mm, find the radius of the other focal sphere.

7. The solid shown in Fig. 5 is cut by the plane A-A which is inclined at 15° to the horizontal plane.

- (a) Draw the plan and elevation of the cut solid.
- (b) Show a development of the all the surfaces of the cut solid.

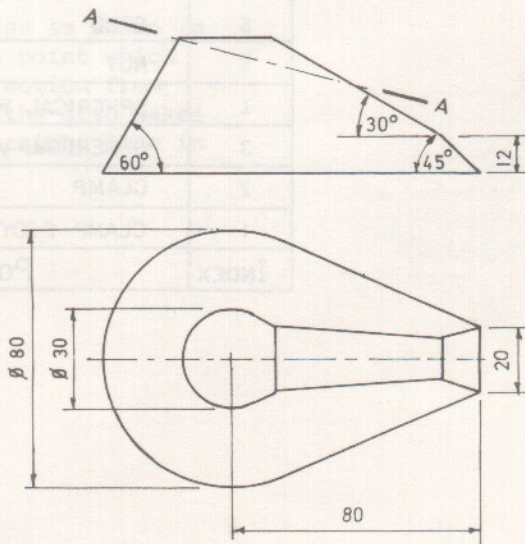


Fig. 5.