LEAVING CERTIFICATE EXAMINATION, 1991

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

WEDNESDAY, 19 JUNE - AFTERNOON, 2.00 to 5.00

(200 marks)

INSTRUCTIONS

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

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

A = 130 - 90 - 10
B = 215 - 15 - 95
C = 165 - 100 - 100
D = 245 - 70 - 25

(a) Determine the dihedral angle between the planes.
(b) Show the projections of a line drawn from C to the line AD and which shall be perpendicular to AD.
(c) On a separate diagram show the projections of the skew lines AD and BC and show the projections of the shortest horizontal distance between them.

2. In Fig. 1 the figure ABCDE consists of three triangles whose areas are in the ratio of 3:4:5.

(a) Draw the given figure.
(b) From B draw two straight lines which shall divide the figure ABCDE into 3 parts so that their areas are in the ratio of 3:4:5.

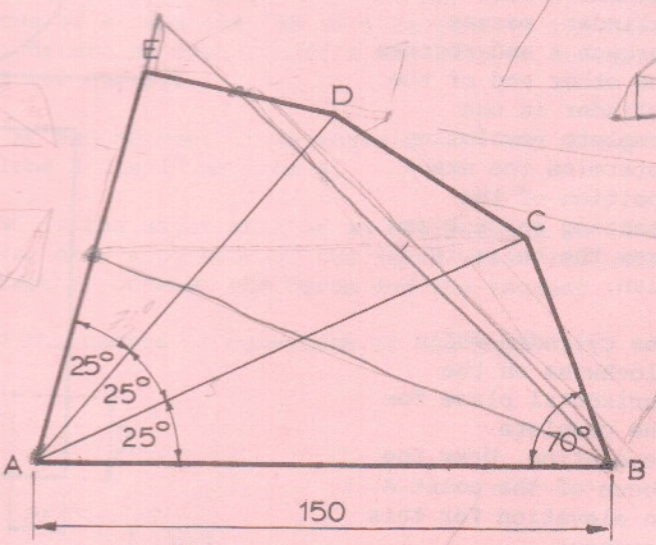

Fig. 1

3. Fig. 2 shows the elevation of two spheres which are in contact with a right cone. The position of the point of contact, P, between the larger sphere and the cone is also shown.

   (a) Draw the elevation, end view and plan of the solids and show the exact position of the point P.

   (b) Draw the traces of a plane which touches the two spheres and which has an inclination of 75^0 to the horizontal plane. Determine the inclination of this plane to the vertical plane.

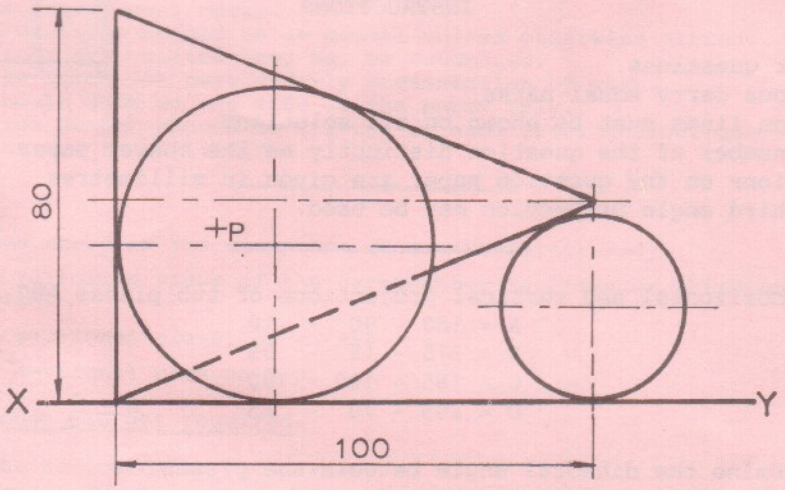

Fig. 2

4. Fig. 3 shows the plan and elevation of a cylinder which lies on the horizontal plane.

   (a) A helix starts at P at one end of the cylinder, passes through A and reaches the other end of the cylinder in one complete revolution. Determine the exact position of the starting point P and draw the helix in plan.

   (b) The cylinder rolls clockwise on the horizontal plane for one complete revolution. Draw the locus of the point A in elevation for this movement.

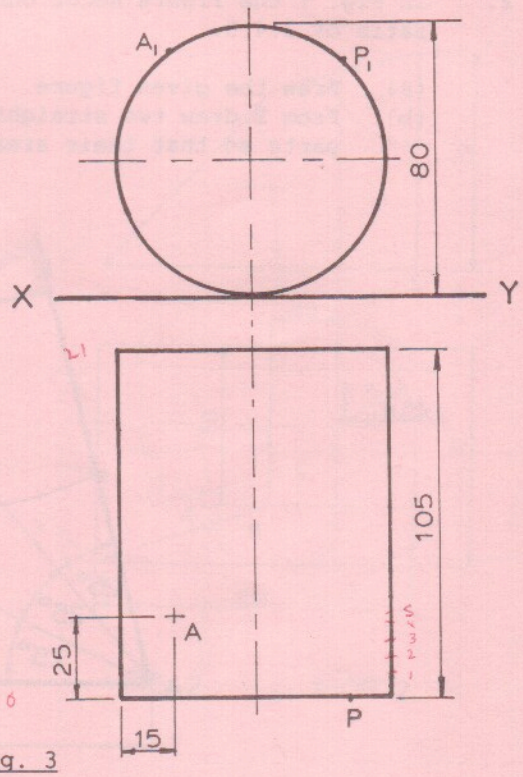

Fig. 3

Fig. 3

5. A square-based right pyramid has a side of base 100 mm and an altitude of 120 mm and it rests with one edge of its base on the horizontal plane as shown in plan and elevation in Fig. 4. Also shown are the projections of a square prism of 35 mm side which penetrates the pyramid. Draw the projections of the solids showing all lines of interpenetration.

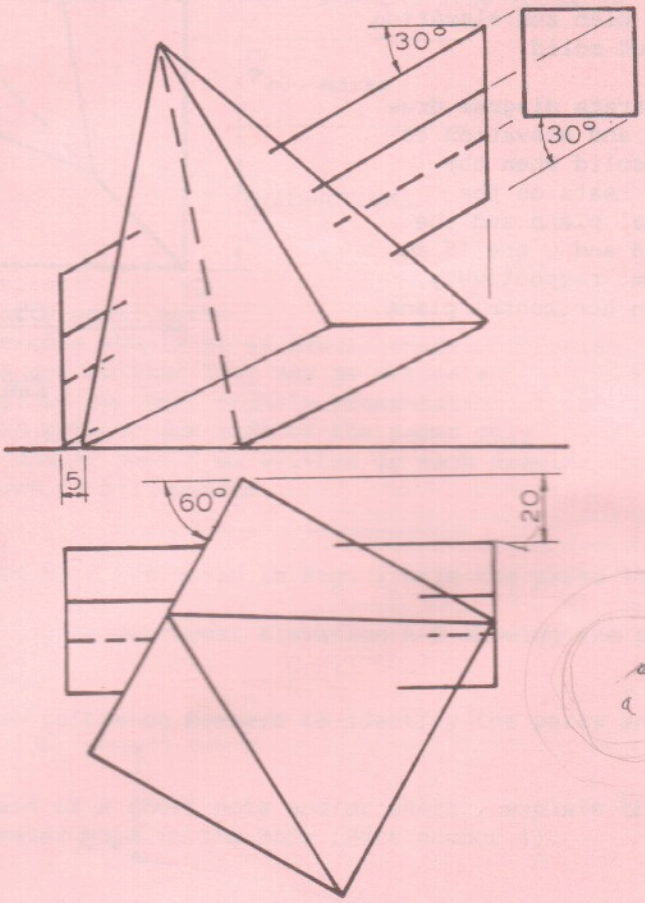

Fig.4

6. (a) Draw a triangle ABF in which AB = 150 mm, AF = 100 mm and BF = 75 mm. If F is the focus of a parabola, AB is a tangent to the curve and A is on the directrix, determine the directrix and axis of the parabola and draw a portion of the curve.

(b) Two lines AC and AD meet at an angle of 30^0 and AC is 180 mm long. A point B on the line AC is 40 mm from A.

(i) If BC is the major axis of an ellipse and AD is a tangent to the curve, draw a portion of the curve which includes the point of contact P, between the curve and the tangent.

(ii) Find the centre of curvature of the point P.

7. Fig. 5 shows the plan of an oblique rectangular pyramid which is cut by an oblique plane. The base ABCD rests on the horizontal plane. The true lengths of the edges OA, OB and OD are 100 mm, 90 mm and 85 mm long, respectively.

   (a) Draw the plan and elevation of the cut solid.

   (b) On a separate diagram draw the plan and elevation of the cut solid when the corner A rests on the horizontal plane and the corners B and C are 15 mm and 50 mm, respectively, above the horizontal plane.

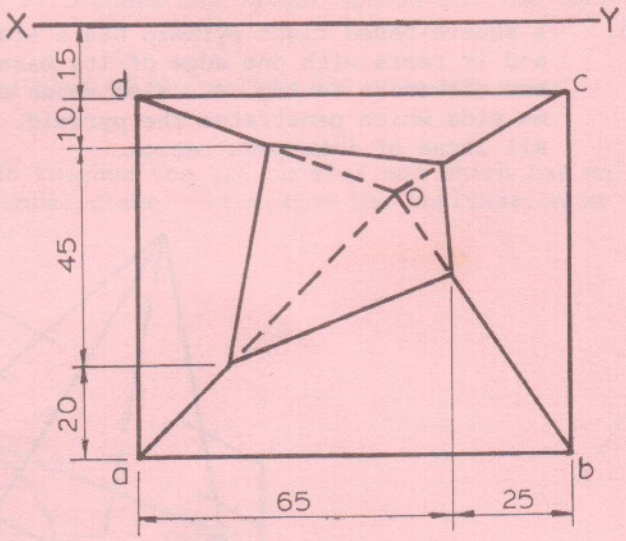

Fig. 5