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LEAVING CERTIFICATE EXAMINATION, 2002

TECHNICAL DRAWING – HIGHER LEVEL – PAPER 1

(Plane and Solid Geometry)

Thursday, 13 June – Afternoon 2.00 p.m. to 5.00 p.m.

(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 DEF.

A	=	140	---	10	---	15
B	=	60	---	75	---	10
C	=	195	---	95	---	80
D	=	50	---	10	---	25
E	=	125	---	105	---	65
F	=	180	---	35	---	15

(a) Determine the line of intersection between the planes.

(b) Determine the dihedral angle between the planes.

(c) Show the projections of a line drawn from E, which is 60mm long, is parallel to the plane ABC and is inclined at 40° to the horizontal plane.

(d) On a separate diagram, draw the projections of the skew lines AB and DE and show the projections of the shortest horizontal distance between them.

2. Fig. 1 shows a quadrilateral ABCD inscribed in a circle whose centre is O. In the given figure, the triangle BCD has a perimeter of 235mm.

(a) Draw the given figure, showing clearly how the points O, B, D and C are obtained.

(b) Redraw the quadrilateral ABCD. Join DO and continue a line from O, which shall divide the quadrilateral ABCD into two parts so that their areas are in the ratio of 2:3.

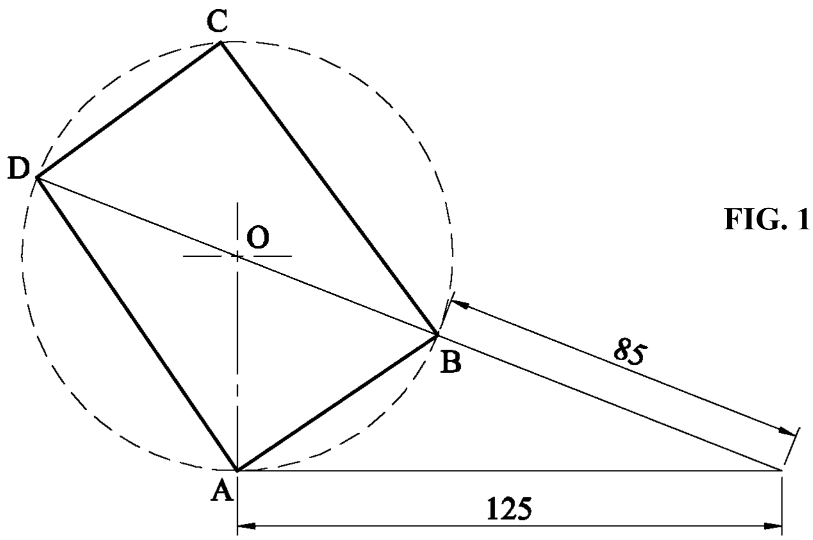

FIG. 1

3. Fig. 2 shows the plan of a right cone, having an altitude of 110mm and standing on the horizontal plane. Also shown are two points P and Q on the surface of the cone.

(a) Draw the plan and elevation of the cone and show the projections of a sphere, which rests on the horizontal plane and touches the cone at the point P.

(b) Draw the traces of a tangent plane to the cone and the sphere.

(c) Draw the projections of a second sphere, which touches the cone at the point Q and is in contact with the vertical plane.

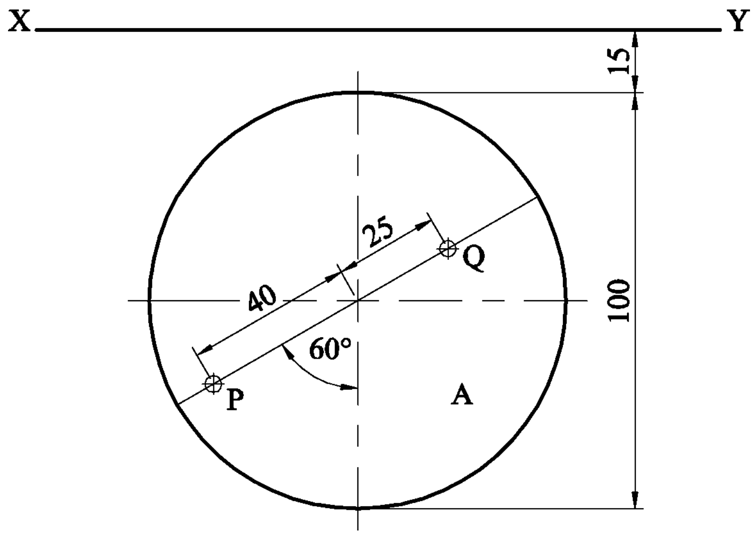

FIG. 2

4. Fig. 3 shows the projections of a square based right pyramid, which has been cut as shown. Also shown are the incomplete projections of a square based prism of 33mm side, which penetrates the cut pyramid.

Draw the projections of the solids showing all lines of interpenetration.

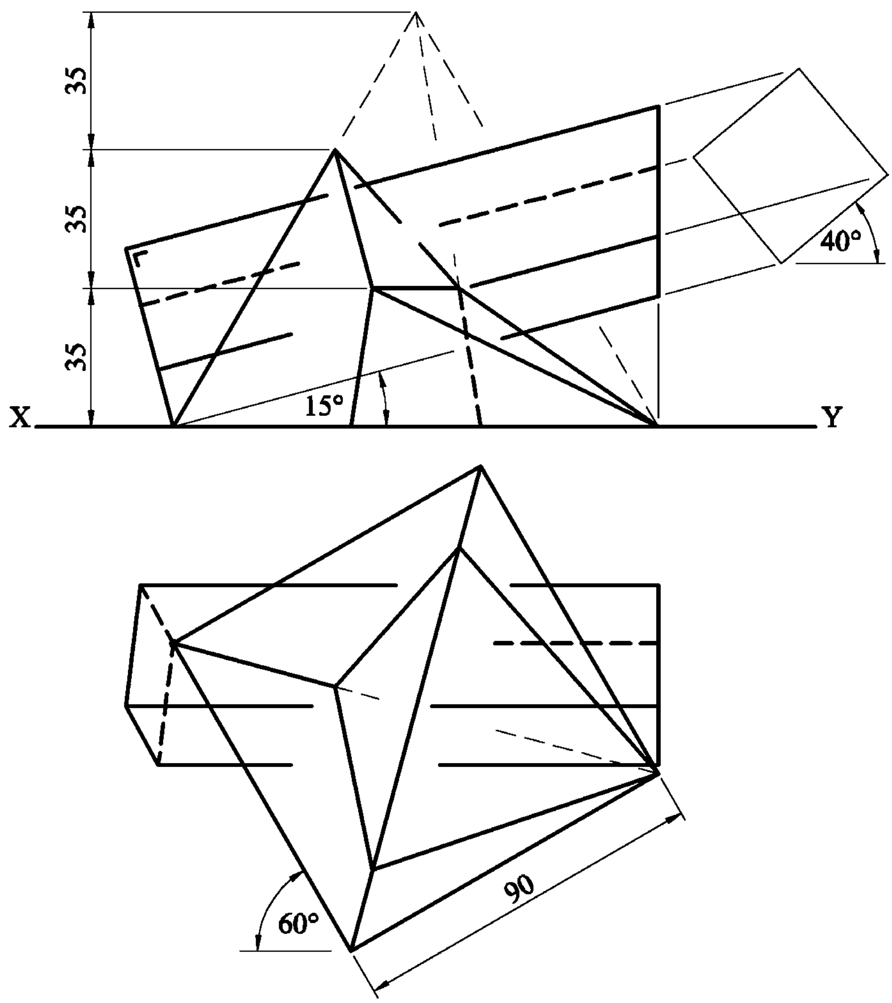

FIG. 3

5. Fig. 4 shows a circle C, which rolls clockwise along the line AB for three-quarters of a revolution. Also shown is the initial position of a point P on the circle. During the rolling of the circle, the point P moves along the semi-circle POA to A.

(a) Draw the locus of P for the combined movement.

(b) On a separate diagram redraw the semi-circle POA and draw the locus of an involute, which is unwound from P to A in a clockwise direction.

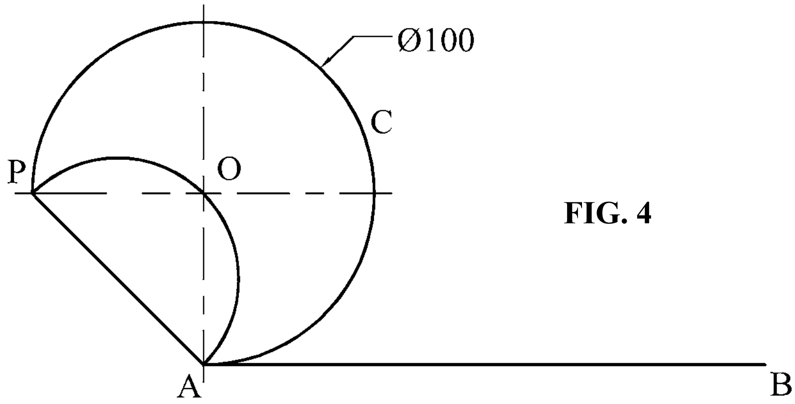

FIG. 4

6. **(a)** Draw a straight line AFB, where AF is 35mm long and FB is 85mm long. F is the focus of a parabola and A and B are points on the curve.

(i) Draw a portion of the curve to include the points A and B.
(ii) Find the centre of curvature for the point A.

(b) Two lines, AB and AD, meet at an angle of 35°. AD is 180mm long.
A point C is located on the line AD, 60mm from A. C and D are focal points of an ellipse and AB is a tangent to the curve.

(i) Draw a portion of the curve.
(ii) Find the point of contact between the tangent AB and the curve.

7. A square based right pyramid with a side of base 60mm and an altitude of 75mm rests with one edge of its base on the horizontal plane and a corner of the base touching the vertical plane as shown in plan and elevation in Fig. 5. Also shown are the traces of an oblique plane VTH.

(a) Draw the plan and elevation of the pyramid.
(b) The pyramid is cut by the oblique plane VTH. Draw the projections of the pyramid when it has been cut by this plane.
(c) Determine the angle of inclination of the face ABO to the horizontal plane.

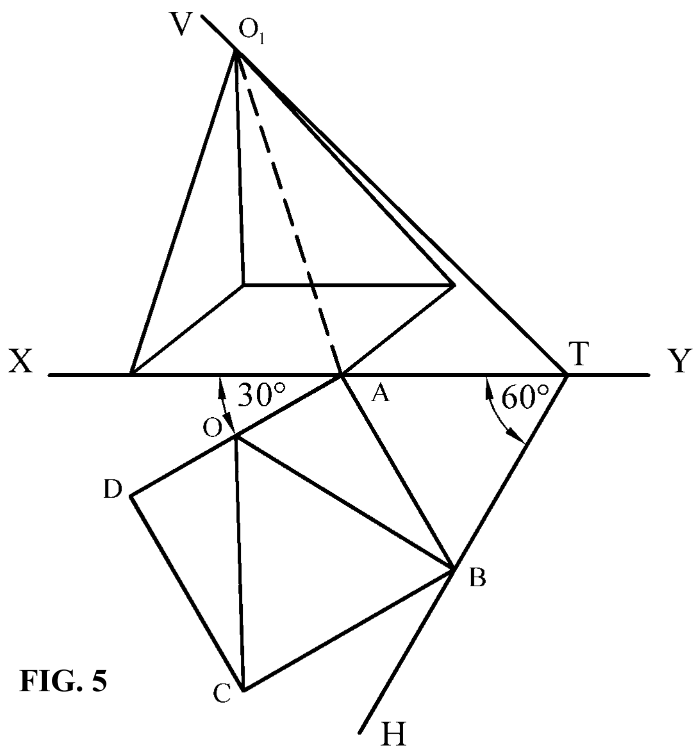

FIG. 5