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LEAVING CERTIFICATE EXAMINATION, 2001

TECHNICAL DRAWING - HIGHER LEVEL - PAPER I

(Plane and Solid Geometry)

DAY, DATE - AFTERNOON 2.00 p.m. - 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 ADE.

A	=	165	---	15	---	105
B	=	215	---	85	---	20
C	=	100	---	70	---	85
D	=	230	---	55	---	80
E	=	115	---	100	---	30

(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 65mm long is parallel to both the vertical plane and the plane ABC.

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

2. Fig. 1 shows an irregular pentagon ABCDE. The triangle ACD is similar to the triangle ABC. The triangle ADE has an area equal to a square of 60mm side.

(a) Draw the given figure showing all constructions clearly.

(b) Redraw the quadrilateral ABCD on a separate diagram. On the diagram draw a triangle similar to ADE, having one vertex at C and the other two vertices on the sides AB and AD respectively.

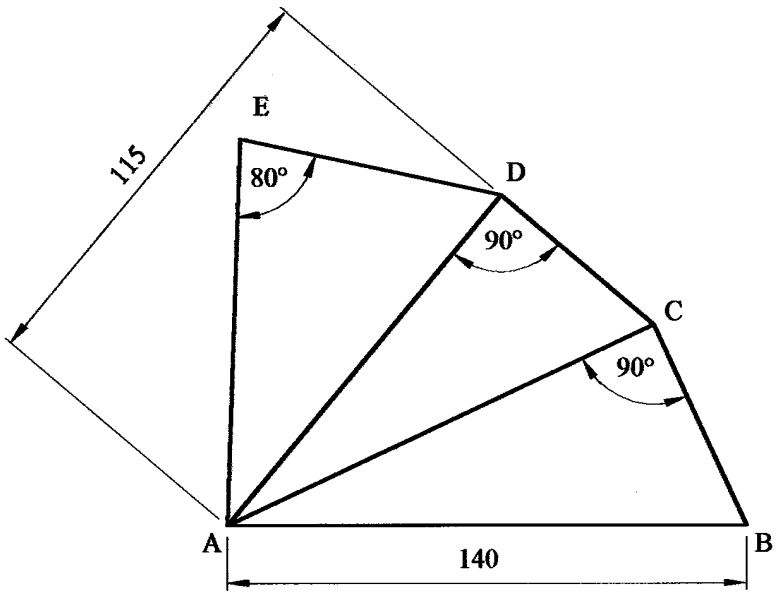

FIG. 1

3. Fig. 2 shows the plan of a sphere A, which rests on the horizontal plane. Also shown is the position of a point P on the underside of the sphere.

(a) Draw the given plan and project an elevation of the sphere showing clearly how the point P is located in elevation.

(b) Show the projections of another sphere B, which rests on the horizontal plane and touches the sphere A at point P.

(c) Draw the projections of another sphere of radius 40mm in position C, which touches the horizontal plane, the vertical plane and the sphere A.

(d) Determine the traces of a plane tangential to spheres A and B and having an inclination of 55° to the horizontal plane.

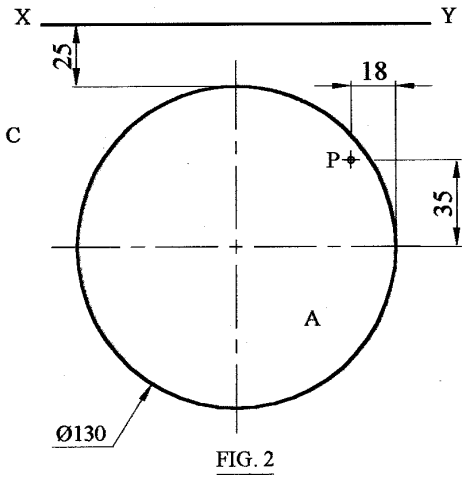

FIG. 2

FIG. 2

4. Fig. 3 shows the projections of a regular pentagonal prism of 53mm side, which rests on the horizontal plane and is shaped as shown.

Also shown are the incomplete projections of an equilateral triangular prism of 47mm side, which penetrates the solid.

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

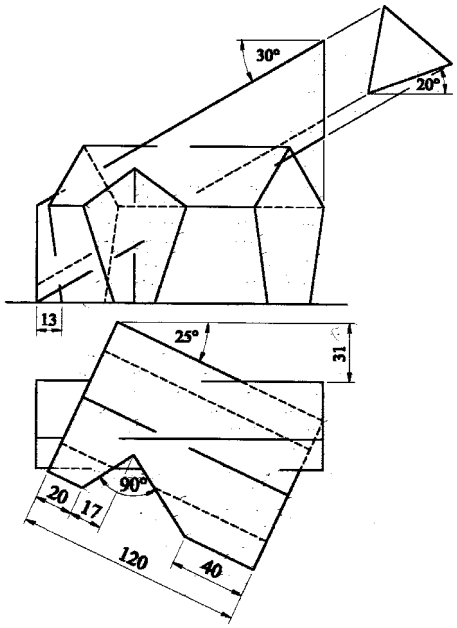

FIG. 3

5. **(a)** In Fig. 4 the profile PCDA rolls clockwise along the line AB until the point D reaches the line AB. During the rolling of the profile, the point P moves along the lines PA and AD to D.

Draw the locus of P for the combined movement.

(b) On a separate diagram draw one convolution of a logarithmic spiral where the longest radius is 160mm and the lengths of succeeding radii at 30° intervals decrease in the ratio of 8:7.

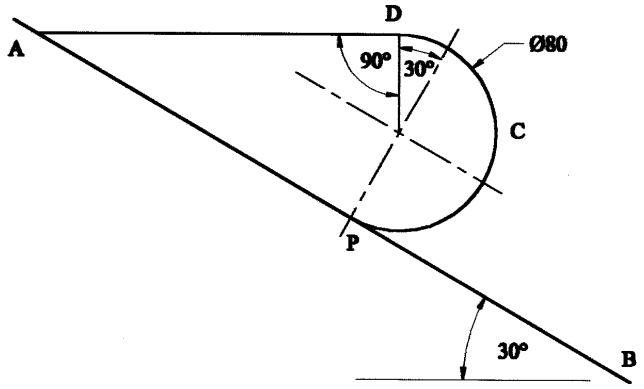

FIG. 4

6. **(a)** Two lines VF and DF meet at an angle of 45°. VF is 30mm long and DF is 80mm long. V is the vertex of an hyperbola whose focus is F. D is a point on the directrix.

Draw a portion of the curve.

(b) Draw a triangle FCP where FC = 60mm , CP = 90mm and FP = 50mm. F is one of the focal points of an ellipse, P is a point on the curve and C is the centre of curvature of the point P.

(i) Determine a position for the second focal point and draw half the curve.
(ii) Draw a tangent to the curve which shall be parallel to the line FC, showing clearly how the point of contact is obtained.

7. Fig. 5 shows the traces of two oblique planes VTH and $V_1T_1H_1$. A regular tetrahedron whose edges are 90mm long rests with its base on VTH. One edge of the base lies in the line HT and a corner of the base touches the vertical plane.

(a) Draw the given traces and the plan and elevation of the tetrahedron.
(b) The tetrahedron is cut by the oblique plane $V_1T_1H_1$. Draw the projections of the tetrahedron when it has been cut by this plane.

FIG.5