LEAVING   CERTIFICATE   EXAMINATION,   1987

TECHNICAL DRAWING - HIGHER LEVEL - PAPER I

(Plane and Solid Geometry)

THURSDAY, 25 JUNE - AFTERNOON 2.00 to 5.00 p.m.

(200 marks)

Tuesday 1:30

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 DEFG;

$$A = 140 - 80 - 40$$
$$B = 250 - 25 - 85$$
$$C = 180 - 5 - 10$$
$$D = 200 - 15 - 75$$
$$E = 230 - 90 - 30$$
$$F = 200 - 80 - 10$$
$$G = 170 - 5 - 55$$

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

   (b) Find the dihedral angle between the planes.

   (c) On a separate diagram draw the projections of the skew lines AB and FG and
       determine the shortest distance between them.

2. (a) Draw the diagram shown in Fig. 1

   (b) From B draw two straight lines which shall divide the area of the figure ABCDE
       into three equal parts.

   (c) On a separate diagram draw a triangle similar to ADE having one vertex at B,
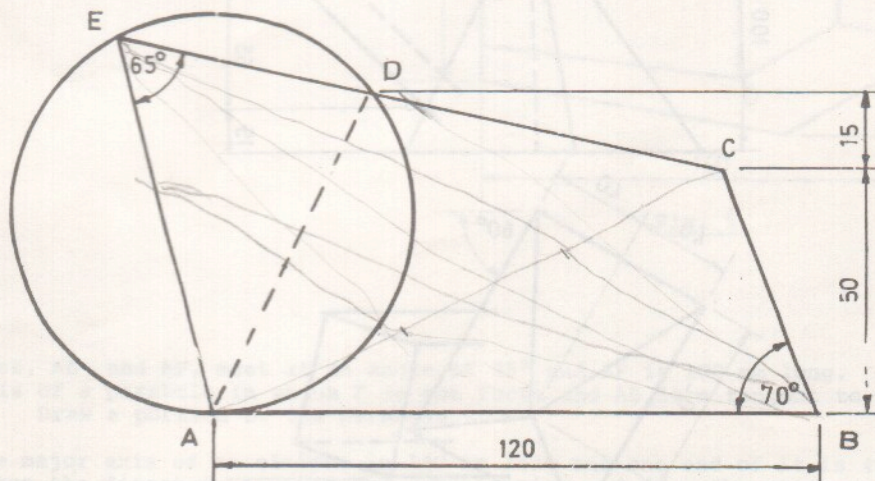   another vertex on CD and the third vertex on the circumference of the circle.

Fig. 1

3. Fig. 2 shows the plan of a right regular
pentagonal pyramid having a base ABCDE and
apex O.   Each edge of the base is 60 mm long.
The edge AB rests on the horizontal plane and
the base is inclined at 20° to the
horizontal plane.

    (a) Draw the plan and elevation of the
        pyramid.

    (b) Draw the projections of a sphere
        which rests on the horizontal
        plane, touches the base of the
        pyramid and has its centre
        directly below the corner D.

    (c) Find the inclination of the edge OC
        to the horizontal plane.   Hence
        draw the traces of a plane which
        contains the line OC and touches
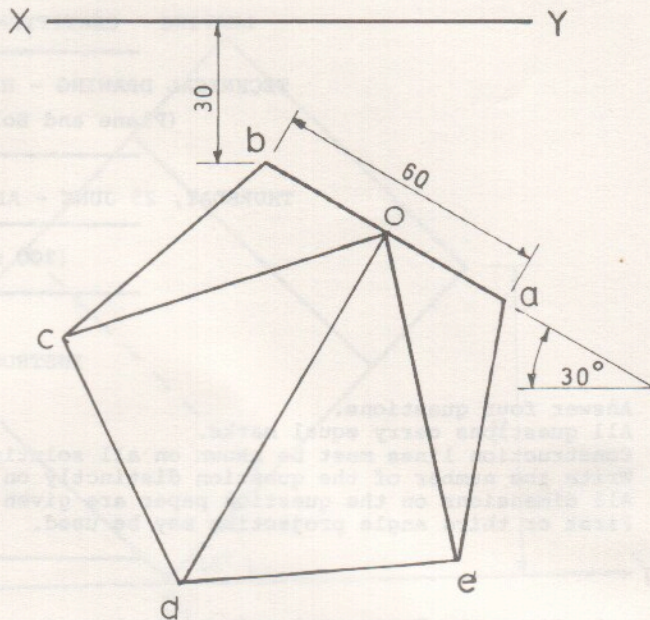   the sphere.

Fig. 2

4. Fig. 3 shows the incomplete projections of an oblique rectangular pyramid and a
square prism which penetrate each other.
    Complete the projections of the solids showing all lines of interpenetration.

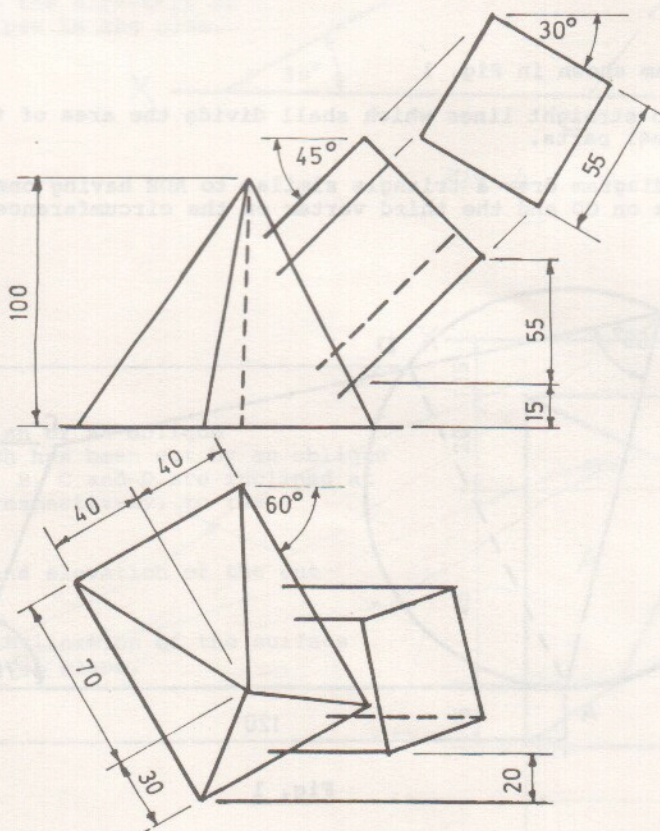

Fig. 3

5. (a) Fig. 4 shows the elevation of a right
       cone lying on the horizontal
       plane.   The diameter of the
       base is 120 mm and the altitude
       is 135 mm.

   Draw the elevation and plan of the
   cone and show the projections of
   the spiral which starts at the
   point P on the base and moves to
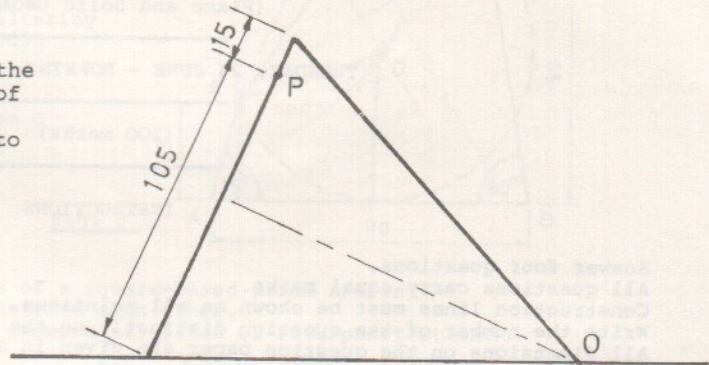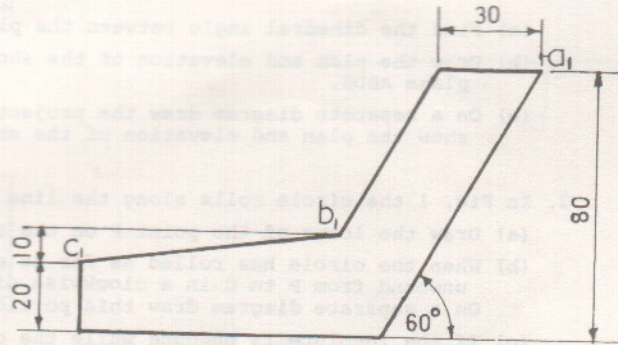   the apex O of the cone in one
   complete revolution.

   (b) (i) Draw one convolution of an
            Archimedian spiral where
            the shortest radius is
            30 mm and the increase in
            succeeding radii is 5 mm per
            radian.

        (ii) Draw the tangent and
             normal at a point on the
             curve 55 mm from the pole.

Fig. 4

6. Fig. 5 shows the plan and elevation
of a solid.

   (a) Draw the given figure.

   (b) The solid is cut by an oblique
       plane which passes through
       the corners A, B and C.
       Draw the plan and elevation
       of the cut solid and show
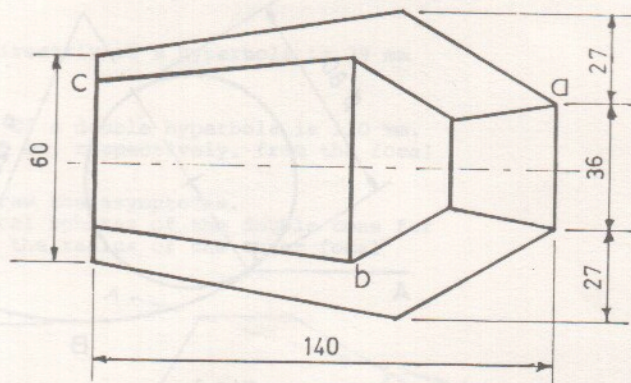   the true shape of the section.

Fig. 5

7. (a) Two lines, AB and AF, meet at an angle of 35° and AF is 100 mm long.   AF is
       the axis of a parabola in which F is the focus and AB is a tangent to the
       curve.   Draw a portion of the parabola.

   (b) (i) The major axis of an ellipse is 140 mm long and one end of it is 40 mm
            from the directrix.   Find the eccentricity and draw the ellipse.

        (ii) Draw the evolute to one quarter of the curve of the ellipse.