Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2004

Technical Drawing

Paper 1 - Higher Level
(Plane and Solid Geometry)

(200 Marks)

Thursday 17 June
Afternoon, 2.00 – 5.00

(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) *Work on one side of the paper only.*
(f) *All dimensions on the question paper are given in metres or millimetres.*
(g) *First or third angle projection may be used.*

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

A	=	180	---	100	---	80
B	=	155	---	30	---	20
C	=	255	---	5	---	40
D	=	140	---	15	---	85
E	=	165	---	105	---	10
F	=	265	---	40	---	25

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

(b) Determine the dihedral angle between the planes.

(c) Determine the projections of a horizontal line, 55mm in length, drawn from B to the plane DEF. Determine the inclination of this line to the plane DEF.

(d) On a separate diagram, draw the projections of the skew lines AB and EF. Show the projections of the shortest line between them and determine the inclination of this line to the horizontal plane.

2. Fig. 1 shows a quadrilateral ABCD. The triangle ABD is similar to the triangle BCD. Also shown is a regular pentagon which lies within the quadrilateral as shown.

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

(b) Redraw the quadrilateral ABCD on a separate diagram. Construct a quadrilateral similar to ABCD, which has an area equal to that of a square of 90mm side.

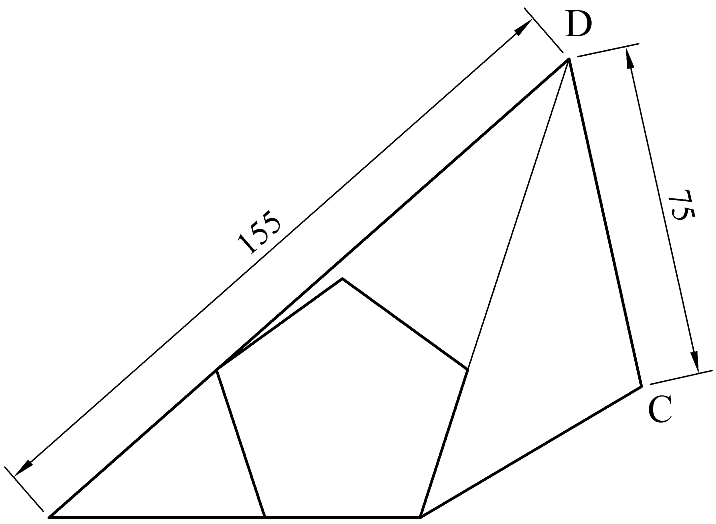

Fig. 1

3. Fig. 2 shows the elevation of a right cone A and a sphere B which are in contact with each other. Also shown is the position of a point P on the front of the ***cone A***.

(a) Draw the elevation and plan of the solids in contact.

(b) Show the projections of another sphere, which rests on the horizontal plane in position C so that it is in contact with the sphere B at a point 47mm above the horizontal plane and is also in contact with the cone A.

(c) Draw the projections of a right cylinder which stands upright on the horizontal plane. The top of the cylinder touches the cone A at the point P and also touches the sphere B.

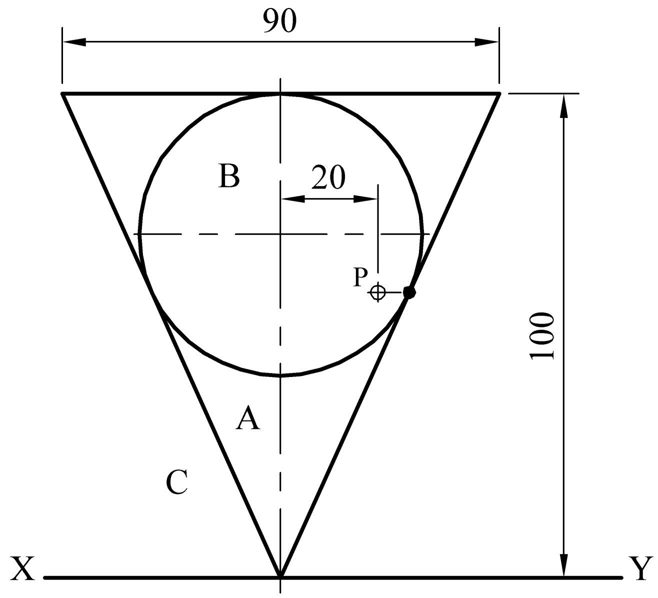

Fig. 2

4. Fig. 3 shows the projections of a solid, composed of a square based pyramid standing on a square based prism. The solid has been cut as shown. Also shown are the incomplete projections of an equilateral triangular prism of 60mm side which penetrates the solid.

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

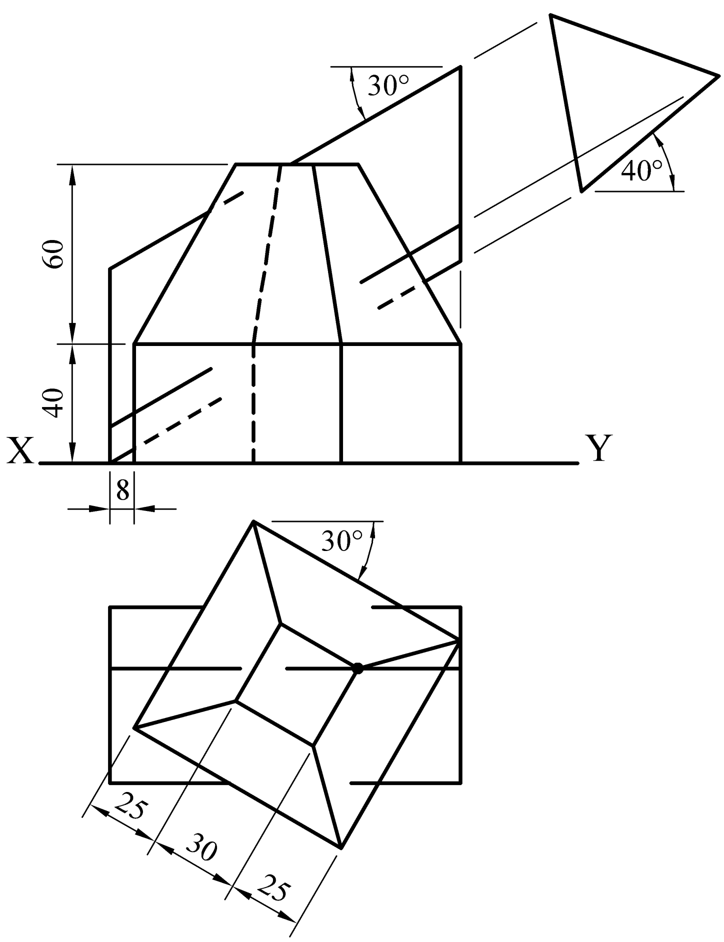

Fig. 3

5. In Fig. 4 the profile PABC rolls clockwise along the lines CD and DE until the point A reaches E.

(a) Draw the locus of point P for this movement.

(b) When the profile has rolled as far as E, the point P is unwound from P to A as an involute to the quadrant PA. Draw the locus of this involute.

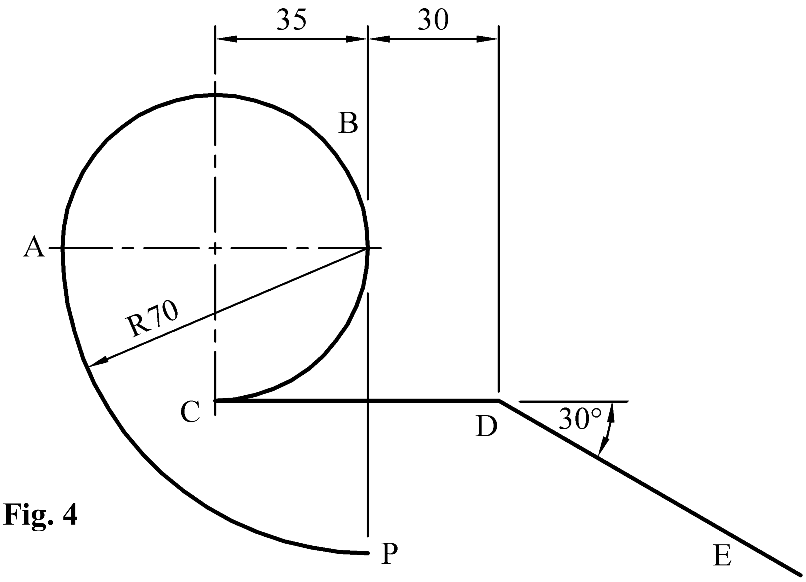

Fig. 4

6. **(a)** Two lines AF and FP meet at an angle of 60°. FP is 65mm long. F is one of the focal points of an ellipse, P is a point on the curve and A is a point on the axis. The eccentricity of the ellipse is 0.75.

(i) Draw half of the curve.

(ii) Draw a tangent to the curve which makes an angle of 45° with the axis, showing clearly how the point of contact is obtained.

(b) Draw a straight line PAC, where PA is 60mm long and AC is 30mm long. A is a point on the axis of a parabola, P is a point on the curve and C is the centre of curvature at the point P.

Locate the focus of the parabola and draw a portion of the curve.

7. Fig. 5 shows the plan of a regular pentagonal right pyramid with a side of base 60mm. The base ABCDE is inclined at 25° to the horizontal plane. The edge AB rests on the horizontal plane.

The pyramid is cut by an oblique plane as shown. The cut surface is inclined at 60° to the horizontal plane.

(a) Draw the plan and elevation of the pyramid when cut as shown.

(b) Find a point F on the edge AB, so that a line drawn from C to F shall be inclined at 20° to the horizontal plane.

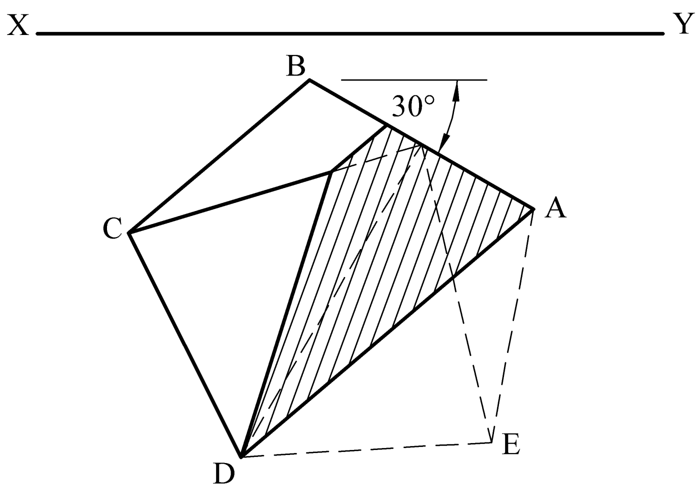

Fig. 5

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