Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2006

Technical Drawing

Paper 1 - Higher Level
(Plane and Solid Geometry)

(200 Marks)

Thursday 15 June
Morning, 9.30 – 12.30

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) *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 ADE.

A	=	165	---	10	---	80
B	=	100	---	85	---	35
C	=	190	---	100	---	45
D	=	120	---	80	---	70
E	=	175	---	80	---	10

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

(b) Determine the dihedral angle between the planes.

(c) Determine the projections of a line, drawn from A to the line DE. The line is to be inclined at 70° to DE.

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

2. Fig. 1 shows a quadrilateral ABCD inscribed in a circle. The area of the triangle ABC is half that of the triangle ACD.

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

(b) Join DO and continue a line from O, which shall divide the area of the quadrilateral ABCD into two equal parts.

(c) On a separate diagram redraw the circle, the chord CD and the point A.

Construct a rectangle having one vertex at A, another vertex on CD and a third vertex on the circumference of the circle. The sides of the rectangle are to be in the ratio 1:2.

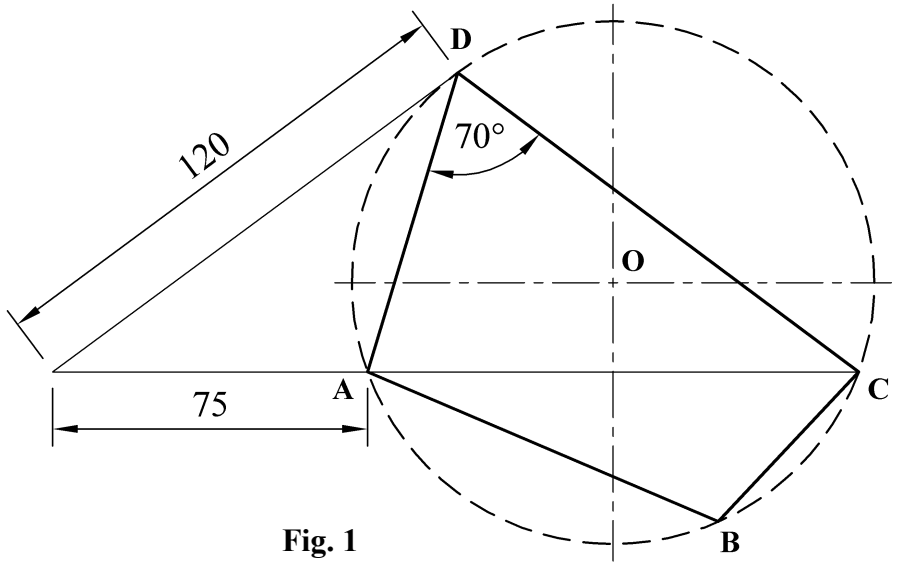

Fig. 1

3. Fig. 2 shows the elevation of a right cylinder A and a right cone B which are in contact with each other. Also shown are the positions of three points P, Q and R on the surface of the cone. The point R is at the ***front*** of the cone.

(a) Draw the elevation and plan of the solids in contact, and draw the projections of a sphere C which rests on the horizontal plane and touches the cone B at the point P.

(b) Draw the projections of another right cylinder which stands upright on the horizontal plane. The top of the cylinder touches the cone B at the point Q and also touches the cylinder A. Show the projections of the line of contact between the two cylinders.

(c) Draw the traces of a plane which passes through the point R, is inclined at 60° to the horizontal plane and is tangential to sphere C.

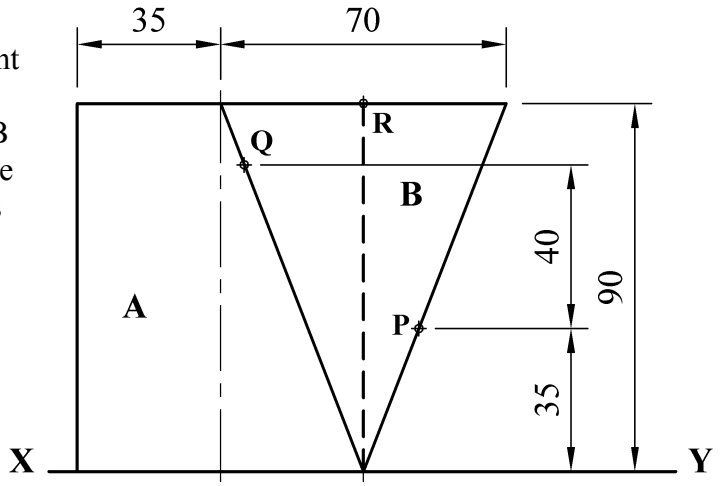

Fig. 2

4. Fig. 3 shows the projections of a regular pentagonal prism of 50mm side, which has been cut as shown. Also shown are the incomplete projections of a square based prism of 44mm side which penetrates the cut pentagonal prism.

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

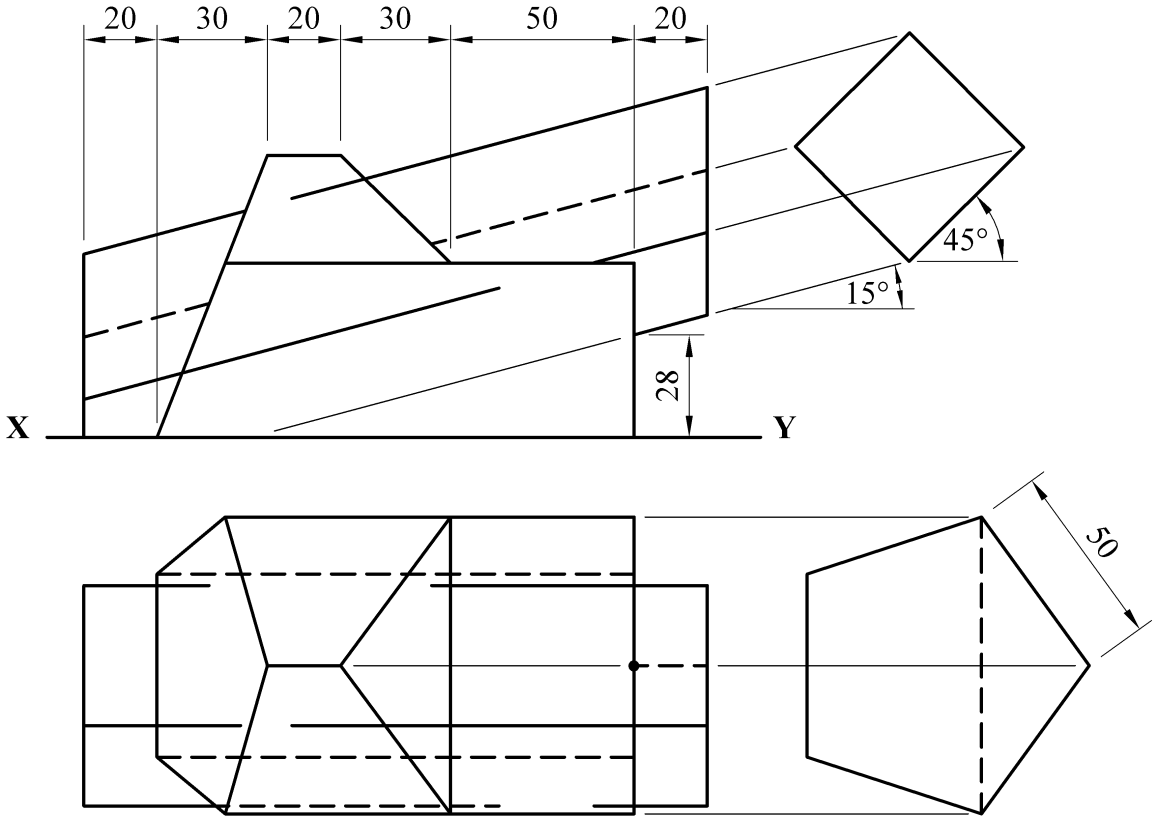

Fig. 3

5. Fig. 4 shows a shaped circle C, which rolls clockwise along the line AB until the point P reaches the line AB. During this rolling of the circle, the point P moves along the arc PA to A, and back to P again.

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

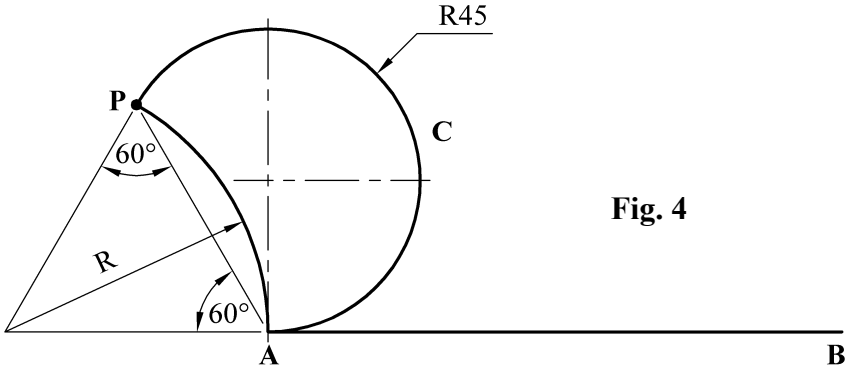

Fig. 4

(b) On a separate diagram, draw half of one convolution of a logarithmic spiral where the shortest radius is 24mm and the lengths of succeeding radii at 30° intervals increase in the ratio of 5:4.

6. **(a)** Draw a straight line AFB, where AF is 25mm long and FB is 55mm long. F is a focal point of an ellipse and A and B are points on the curve. The major axis is 150mm long.

(i) Determine a position for the second focal point and draw a portion of the curve to include the points A and B.

(ii) Draw a circle of radius 20mm that shall touch the ellipse internally at the point B.

(b) Two lines PF and PC meet at an angle of 35°. PF is 35mm long and PC is 100mm long. F is the focus of a parabola, P is a point on the curve and C is the centre of curvature for the point P.

(i) Determine the axis and the directrix and draw a portion of the curve.

(ii) Draw a tangent to the parabola which shall be parallel to the line PF, showing clearly how the point of contact is obtained.

7. Fig. 5 shows the incomplete projections of a regular hexagonal right pyramid and a square based right pyramid. The traces of a simply inclined plane VTH and an oblique plane $V_1T_1H_1$ are also shown. The hexagonal pyramid has a side of base 40mm and an altitude of 80mm and it rests with one of its triangular faces on the horizontal plane as shown. One corner of the base of the pyramid touches the vertical plane.

(a) Draw the given plan and elevation of the hexagonal pyramid and the traces of the simply inclined plane VTH.

(b) The hexagonal pyramid is cut by the plane VTH. Draw the projections of this pyramid when it has been cut by the plane.

(c) A square based right pyramid with a side of base 50mm rests with one of its triangular faces on the oblique plane $V_1T_1H_1$ as shown in plan. One edge of the base lies in the line H_1T_1 and the apex is located at the point A. Draw the traces of the oblique plane $V_1T_1H_1$ and the plan and elevation of the pyramid.

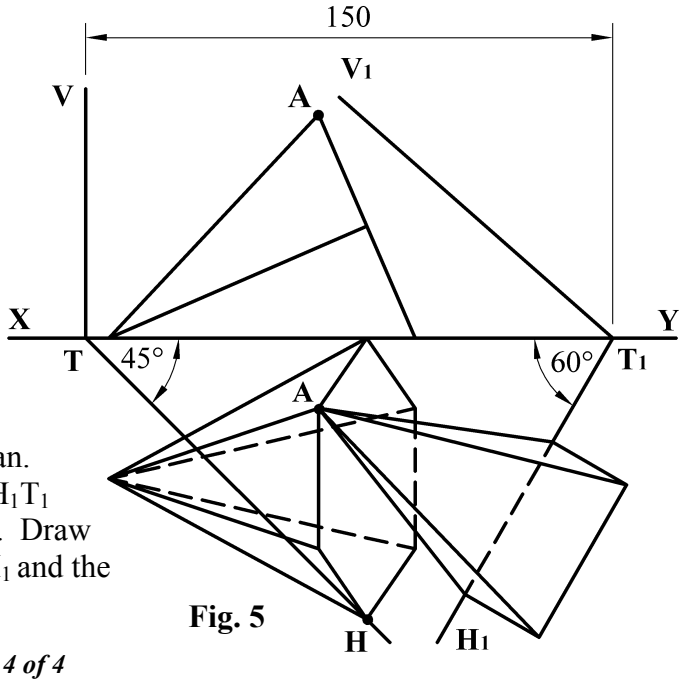

Fig. 5

BLANK PAGE

BLANK PAGE