AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION, 2000

TECHNICAL DRAWING - HIGHER LEVEL - PAPER I

(Plane and Solid Geometry)

THURSDAY, 15 JUNE - 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	=	150	---	85	---	65
B	=	120	---	45	---	10
C	=	180	---	5	---	45
D	=	100	---	30	---	40
E	=	190	---	50	---	20

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

(b) Determine the dihedral angle between the planes.

(c) Find the position of a point P on the plane ABC, which is 35mm above the horizontal plane and 20mm from the plane ADE. Draw a line from D to P and determine its true length.

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

2. Fig. 1 shows a quadrilateral ABCD inscribed in a circle. Also shown is a square inscribed in the quadrilateral.

(a) Draw the given figure.

(b) On a separate diagram, draw a figure similar to the quadrilateral ABCD and having an area equal to a square of 65mm side.

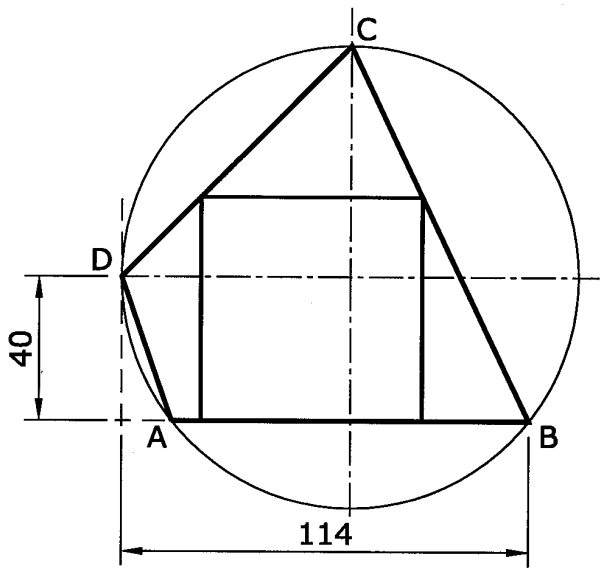


FIG. 1

3. Fig. 2 shows the plan of a right cone A, having an altitude of 80mm, standing on the horizontal plane.

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

(b) Show the projections of a right cylinder having an altitude of 70mm which stands on the horizontal plane so that it is in contact with the cone A at the point Q and also touches the sphere B.

(c) Draw the projections of another sphere so that it touches the cone at the point R and is also in contact with the cylinder.

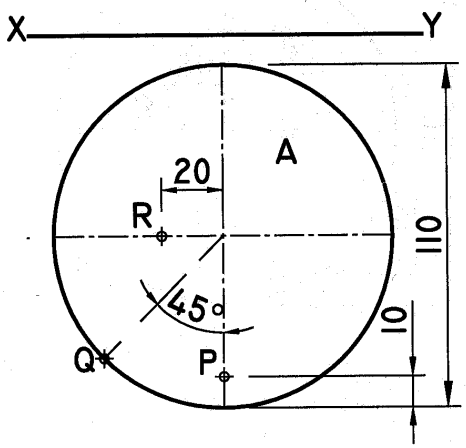


FIG. 2

4. Fig. 3 shows the projections of an equilateral triangular prism, of 90mm side, which lies on the horizontal plane and is shaped as shown.

Also shown are the incomplete projections of a square based prism of 40mm side, which penetrates the solid.

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

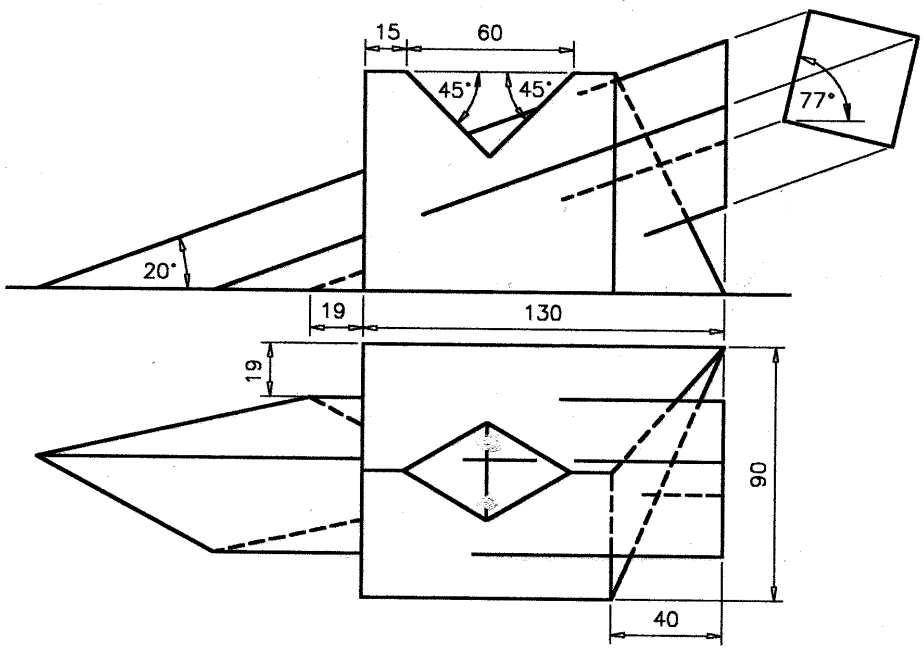


FIG. 3

5. Fig. 4 shows a circle C and a semi-circle D. The circle C rolls clockwise along the line AB for half a revolution. During the rolling of the circle, a point P is unwound from P to M as an involute to the semi-circle.

Draw the locus of P for the combined movement.

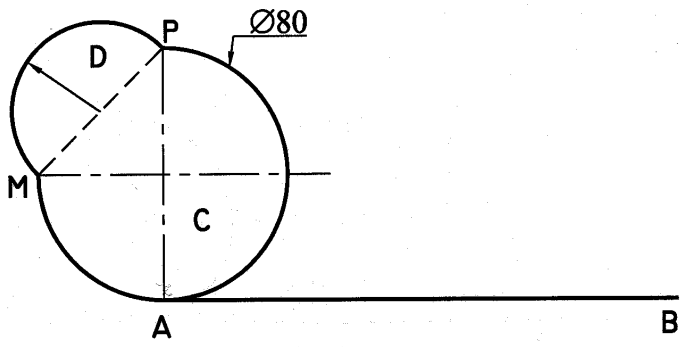


FIG. 4

6. **(a)** Draw a triangle DPD_1 where DD_1 is 40mm long, D_1P is 85mm long and the angle DD_1P is 90°.

P is a point on a parabola, PD is a tangent to the curve and D and D_1 are points on the directrix.

(i) Locate the focus and draw a portion of the curve.
(ii) Locate the centre of curvature for a point on the curve 45mm from the directrix.

(b) Draw a straight line FPP_1 where FP = 25mm and PP_1 = 120mm. F is one of the focal points of a double hyperbola, P is a point on one branch of the curve and P_1 is a point on the other branch. The transverse axis is 90 mm long.

(i) Locate the second focal point and draw a portion of the double curve.
(ii) Draw the asymptotes to the curve.

7. Fig. 5 shows the plan and elevation of an equilateral triangular based prism of 70mm side, which has been cut as shown. The edge AB is inclined at 20° to the horizontal plane and the surface ABC is inclined at 30° to the horizontal plane.

(a) Draw the given plan and elevation.
(b) On a separate diagram, draw a plan and elevation of the prism when the corner D rests on the horizontal plane and the corners E and F are 15mm and 40mm, respectively, above the horizontal plane.

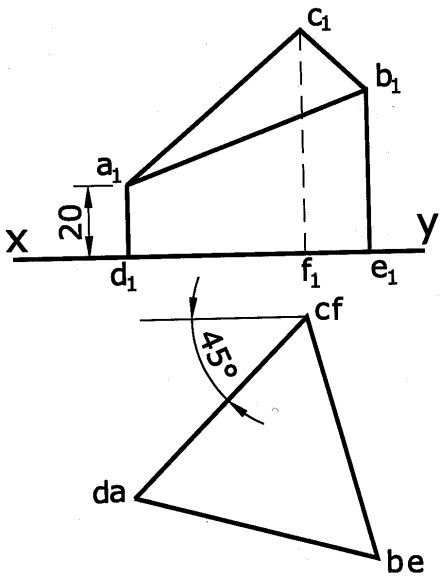


FIG.5

LEAVING CERTIFICATE EXAMINATION, 2000

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A) - ENGINEERING APPLICATIONS

Friday, 16 June, Afternoon 2.00 - 5.00 pm

200 Marks

INSTRUCTIONS

(a) Answer four questions.
(b) All questions carry equal marks.
(c) Drawings and sketches should be in pencil unless otherwise stated.
(d) Where dimensions are omitted they may be estimated.
(e) Credit will be given for neat orderly presentation of work.
(f) Candidates should work on one side of the paper only.
(g) The Examination Number should be written on each drawing sheet used.
(h) All dimensions are in millimetres.

OVER ®

1. Details of a Milling Machine Tailstock are given in Fig. 1 with the parts list tabulated below.

(a) Draw a full size sectional elevation A-A showing the parts fully assembled.

(b) Insert item reference numbers to identify the parts and add the title MILLING MACHINE TAILSTOCK.

(c) With the aid of a neat freehand sketch suggest a modification to the design which will ensure that the handwheel (Part 4) is secured to the adjusting screw (Part 3).

PART	NAME	REQUIRED
1	BODY	1
2	CENTRE	1
3	ADJUSTING SCREW	1
4	HANDWHEEL	1
5	QUILL	1

2. **(a)** Fig. 2 below shows details, in section, of a right-hand, single-start feed screw for an injection moulding machine.
Draw an elevation of this screw for a length of 120 mm, showing its helical form at both outside and root diameters. Hidden details/curves are not required.

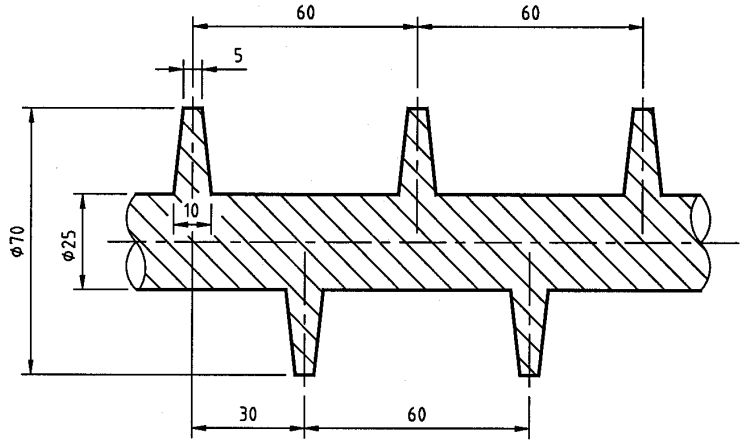


FIG. 2 FÍOR 2

(b) Draw, full size, **one** tooth of a spur gear with 24 teeth of involute form, module 10 and 20° pressure angle.

Tabulate on the sheet the following values for the gear:-

(i) Pitch circle diameter.
(ii) Addendum circle diameter.
(iii) Dedendum circle diameter.
(iv) Base circle diameter.
(v) Circular pitch.
(vi) Tooth thickness.

3. **(a)** Draw the profile and displacement diagram for a cam rotating in an anti-clockwise direction and imparting the following motion to an in-line knife edge follower:

0° to 90°	Rise 42 mm with Simple Harmonic Motion.
90° to 270°	Fall 42 mm with Uniform Acceleration and Retardation.
270° to 360°	Dwell.

The minimum distance between the central axis and the cam edge is 35mm.

(b) Fig. 3 shows three views, in first angle projection, of a pipework run. Using the dimensions given draw, to scale 1:10, **a single line isometric** drawing of the pipework which runs consecutively from point A, through all points and finishing at point G. Make A the lowest point in your drawing and ignore the radius of the pipework bends.

4. The elevation and plan of a thin sheetmetal transition piece, which is connected to a circular duct, is shown in Fig. 4.

(a) Draw the given views and produce a one piece surface development of the transition piece. The development should have the shortest seam possible.

(b) Sketch the following freehand:

(i) A sheetmetal joint suitable for the seam of the transition piece. Using a separate sketch show the seam allowance necessary to make this joint.

(ii) A sheetmetal joint suitable for connecting the transition piece to the circular duct.

Print the name of the sheetmetal joint below each sketch.

OVER ®

5. A sectional elevation of a clutch release mechanism is shown in Fig. 5.

(a) Make the following drawings, scale 1:1, of the flanged housing, part 2.

(i) A sectional elevation corresponding to elevation given;
(ii) A side elevation viewed in the direction of arrow E.

The flange has four equi-spaced counterbored holes for parts 6 and three equi-spaced holes for parts 10.
Dimensions should be taken from the scale provided.

(b) Sketch freehand a pictorial view of a special spanner that would be suitable for removing and tightening the two-hole nut, part 9.

(c) Tabulate a parts list which shows the item number and the name of any **six** of the clutch parts.

6. **Answer SECTION A or SECTION B but not both**

SECTION A

(a) A sectional view of a horizontal plunger pump assembly, with the plunger completing the discharge stroke, is shown in Fig. 6(a).

(i) Make a large neat freehand sketch of the sectional view of the assembly showing the plunger on the suction stroke and with the valves in their correct working position.

(ii) Identify and neatly label on the sketch the following parts:
Plunger, Inlet port, Suction valve, Discharge valve, Discharge manifold, Valve cover, Gland and Seal ring.

(iii) With the aid of arrows, show the direction of fluid flow through the pump.

(b) Sketch freehand the following:

(i) Woodruff key;
(ii) Taper gib head key;
(iii) Round-ended parallel key.

OR

SECTION B

(a) **Briefly** answer the following questions. Sketches may be used where appropriate.

(i) In selecting a CAD system, which **one** of the following is the most important and state the reason for your choice:
- 4.2 Gb Hard disk
- 64 Mb RAM
- 500 MHz Processor
- 17" Monitor.

(ii) Data on a floppy disk may be accidentally corrupted. State two situations which could cause this corruption.

(iii) Show how *'write-protection'* is accomplished with a floppy disk.

(iv) How do the PAN and ZOOM commands differ?

(v) Name **one** Text Font available with CAD and demonstrate the effect of increasing the text width factor.

(vi) What value would you enter to scale an object to one quarter of its original size?

(vii) Using circles sketch an example of an array using five columns and three rows.

(viii) Sketch an example of baseline dimensioning.

(ix) List **two** types of plotter suitable for producing plots of CAD drawings.

(x) What command normally restores objects just erased?

(b) Fig. 6(b) shows the main window of a CAD system, with 10 parts identified with item reference numbers 1 to 10. Match each of the numbered items with the correct term from the following selection:
- *Layer name,*
- *Dimension toolbar,*
- *Scroll box,*
- *Screen menu,*
- *Crosshair cursor,*
- *Close button,*
- *Drawing title,*
- *Co-ordinate display,*
- *Drawing area,*
- *Paper space icon.*

(c) Make pictorial sketches to show the results of the following solid modelling operations:

(i) The cylinder which is penetrating the cone in Fig. 6(b) 1 is subtracted from the cone.

(ii) The hexagon in Fig. 6(b) 2 is extruded a height of 80 mm with a taper angle of 5^{o} .

(iii) The profile in Fig. 6(b) 3 is revolved clockwise through 180^{o} about the axis Y-Y.

(d) List **ten** CAD commands you would use in producing the drawing of the guitar shown in Fig. 6(b) 4.

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA **M.84(L)**

SCRÚDÚ ARDTEISTIMÉIREACHTA

2000

LÍNÍOCHT THEICNIÚIL - ARDLEIBHÉAL

PÁIPÉAR II(A)

FEIDHMIÚCHÁIN INNEALTÓIREACHTA

AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA

LEAVING CERTIFICATE EXAMINATION

2000

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(A)

ENGINEERING APPLICATIONS

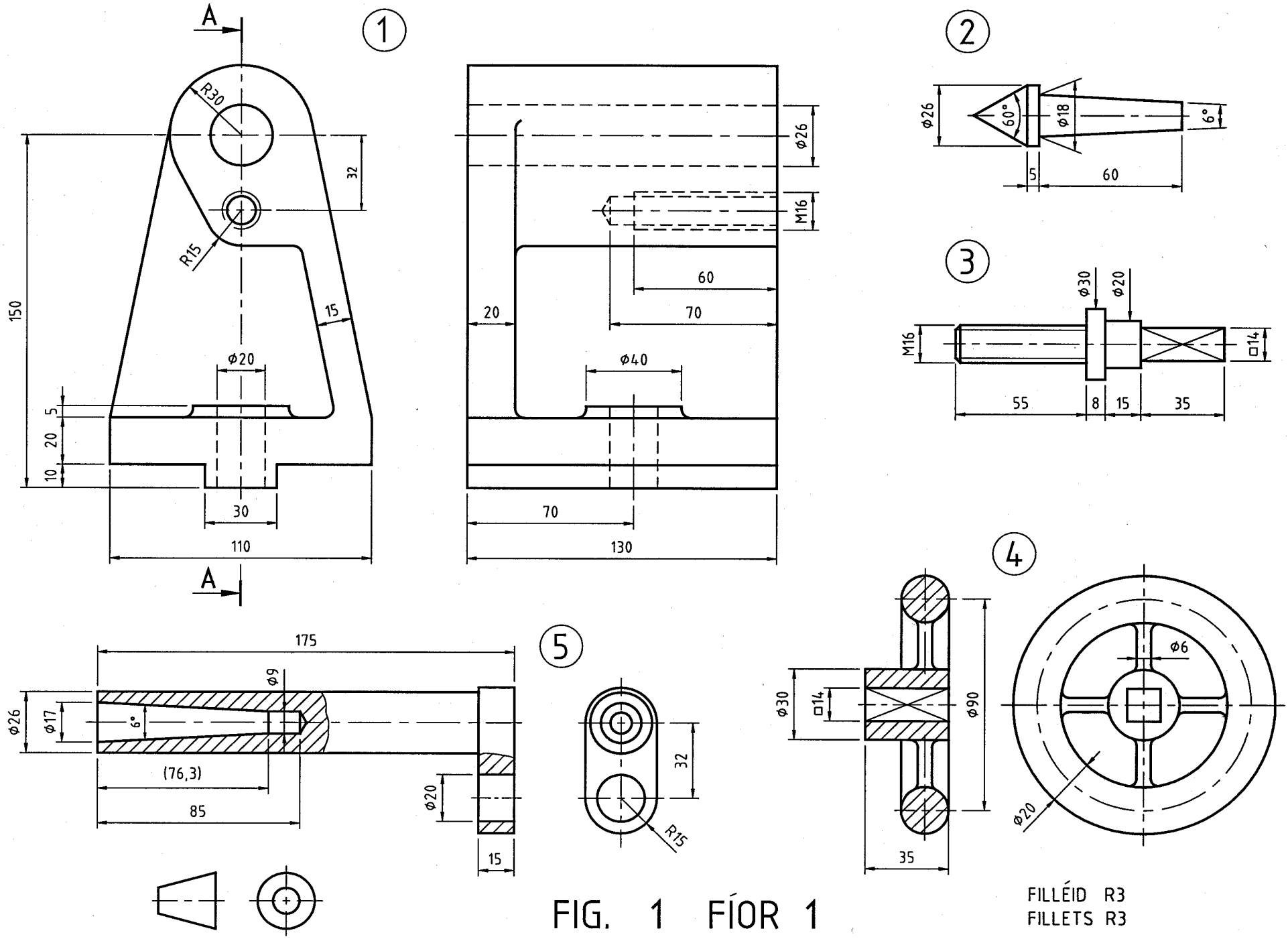


FIG. 1 FÍOR 1

FILLÉID R3
FILLETS R3

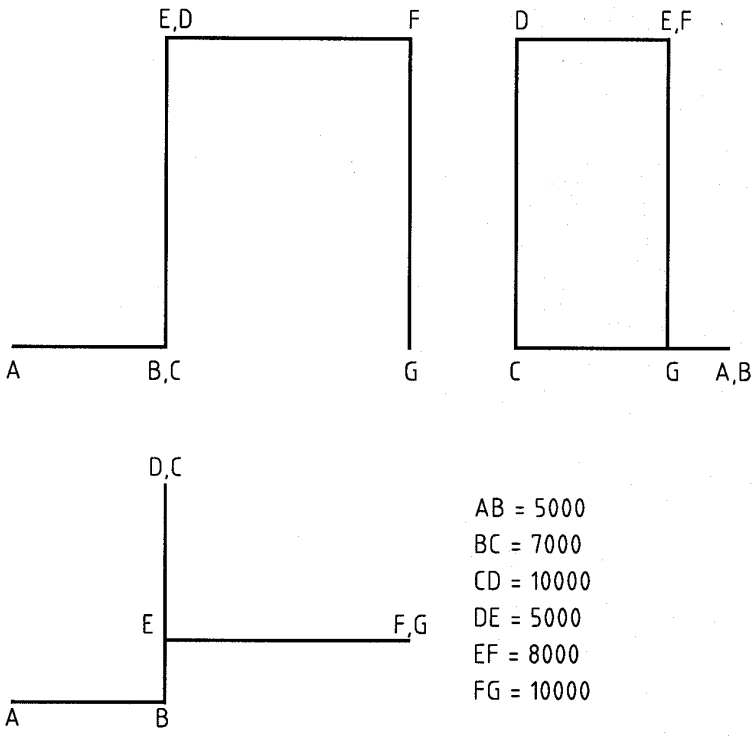
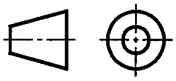


FIG. 3 FÍOR 3



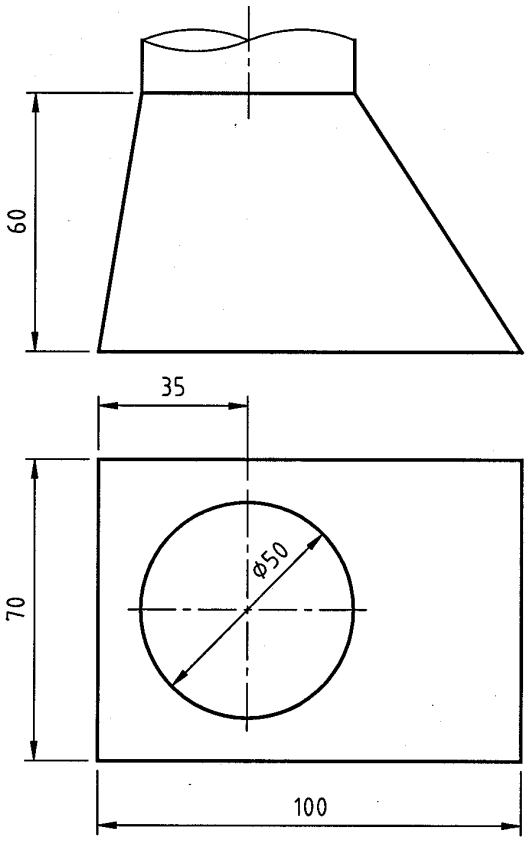


FIG. 4 FÍOR 4

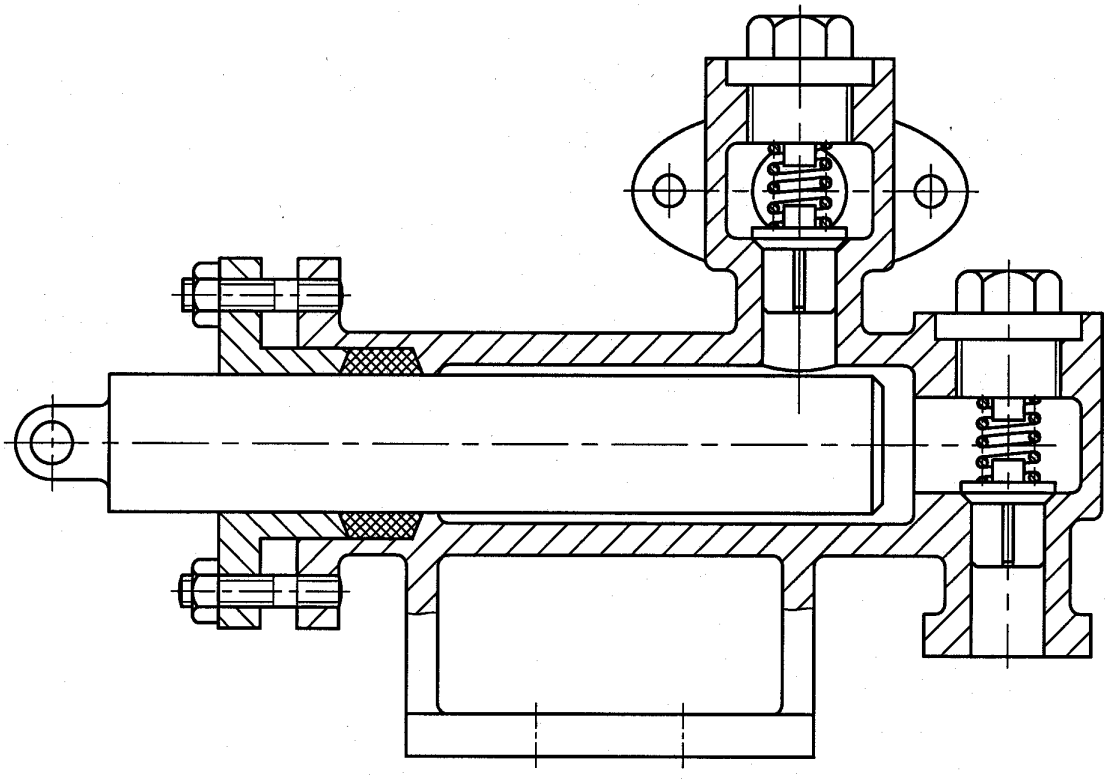


FIG. 6a FÍOR 6a

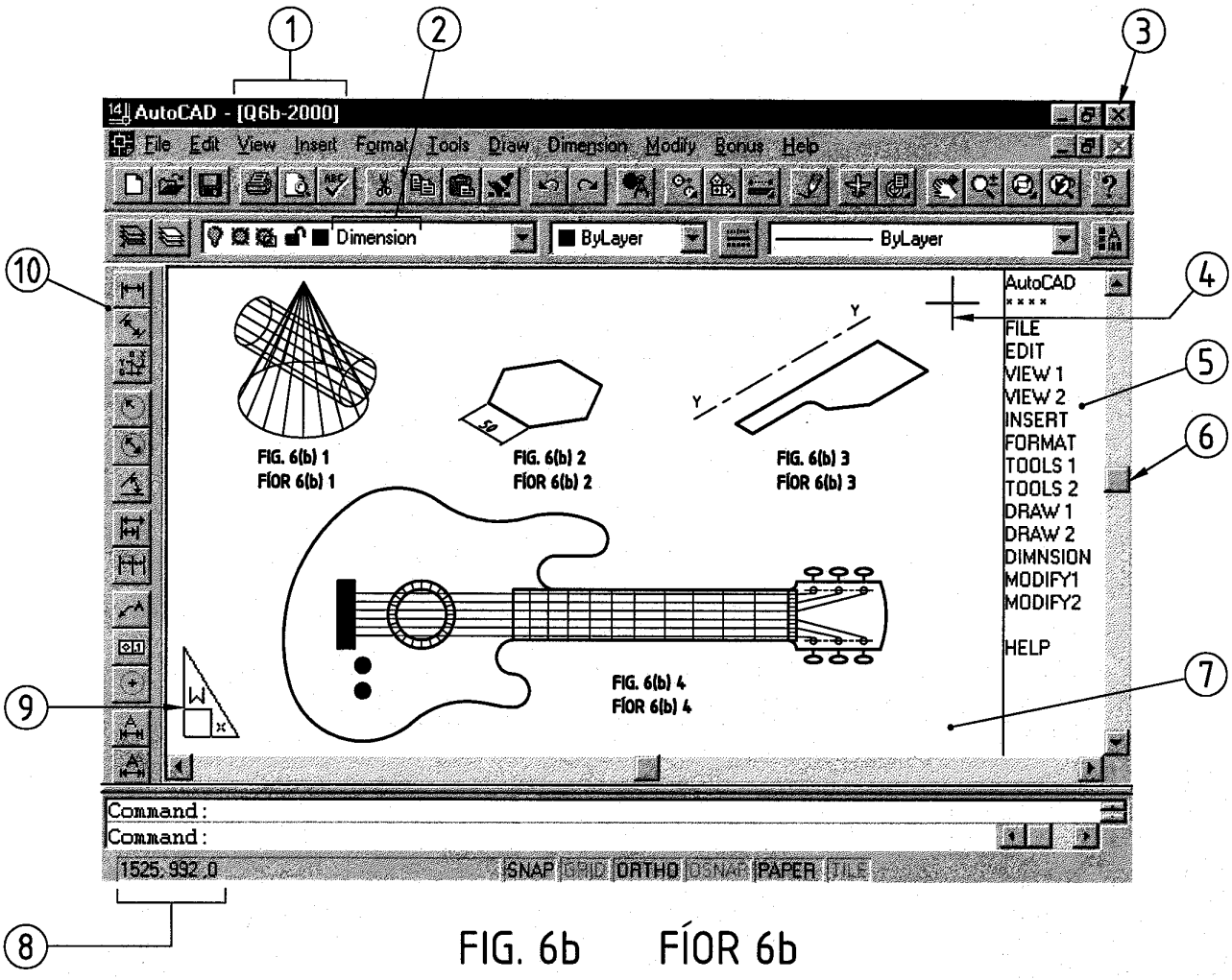


FIG. 6b FÍOR 6b

LEAVING CERTIFICATE EXAMINATION, 2000

TECHNICAL DRAWING - HIGHER LEVEL

PAPER II(B) - BUILDING APPLICATIONS

FRIDAY, 16 JUNE - AFTERNOON 2.00 P.M. TO 5.00 P.M.

(200 Marks)

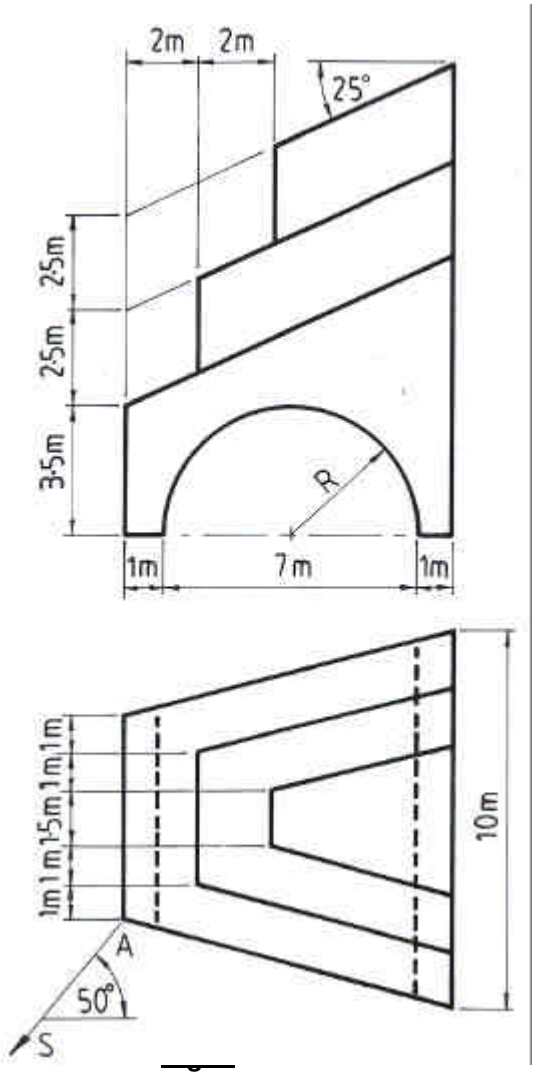
INSTRUCTIONS

(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) First or third angle projection may be used.
(f) All measurements are given in metres.

OVER ®

1. Draw a perspective view of the structure shown in Fig. 1. The picture plane passes through the corner A, the spectator S is 9 m from the corner A and the horizon line is 9 m above the ground line.
Use auxiliary vanishing points where appropriate.

Scale 1 : 100



2. Fig. 2 shows the outline plan and elevation of roof surfaces and a dormer window. Surface A has a pitch of 50° and surface B has a pitch of 45° The line of intersection between surfaces A and D has a true inclination of 35° to the horizontal plane. Surfaces E and G have a pitch of 50° and surface F has a pitch of 15°. The dihedral angle between the surfaces C and D is 100°

(a) Draw the given plan and elevation.

(b) Determine the dihedral angle between the surfaces A and B.

Scale 1 : 100

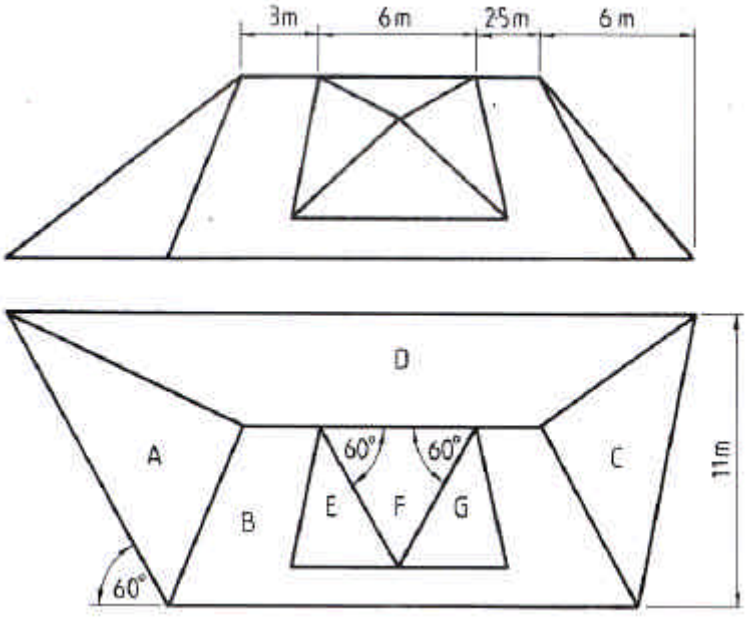


FIG. 2

3. Fig. 3 shows the outline plan and elevation of a structure. Draw the given views and determine the shadows and shade in plan and elevation when the direction of the light is as shown in the figure.

Scale 1 : 100

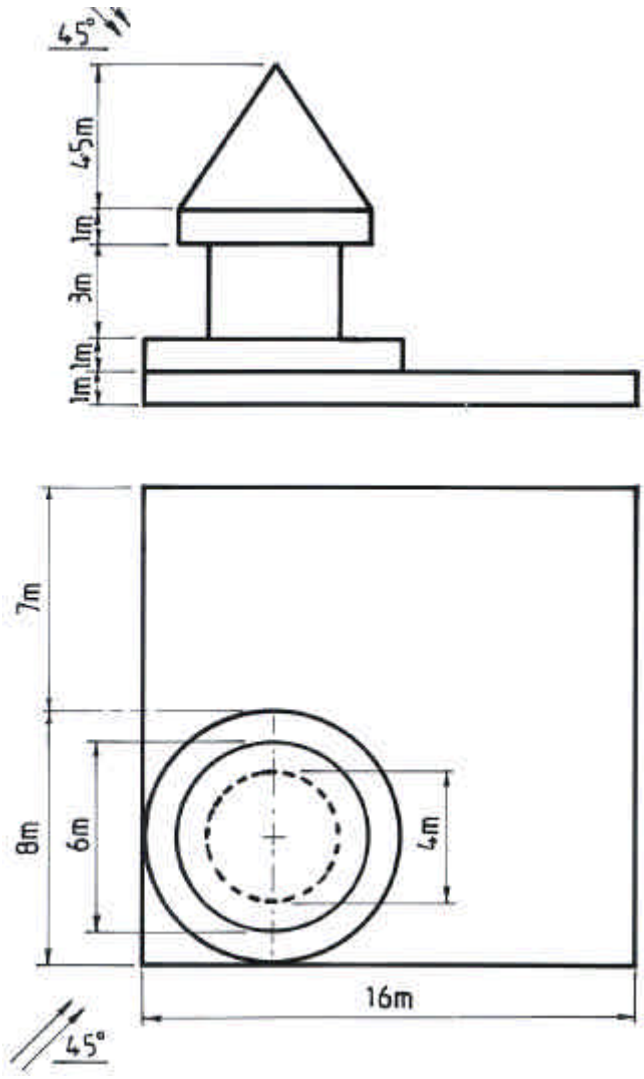


FIG. 3

4. A roof system in the form of a shell structure which incorporates a roof light is shown in the pictorial sketch in Fig. 4. Also shown is the outline elevation and end elevation of the roof. The shell structure is generated by translating a straight line, such as BP, which remains in contact with line GH and the parabola ABC and which is always parallel to the plane director BPS. The curve DEF of the roof light is a parabola.

(a) Draw the given elevation and end elevation and project a plan.

(b) Draw a development of the surface R of the roof-light.

Scale 1 : 200

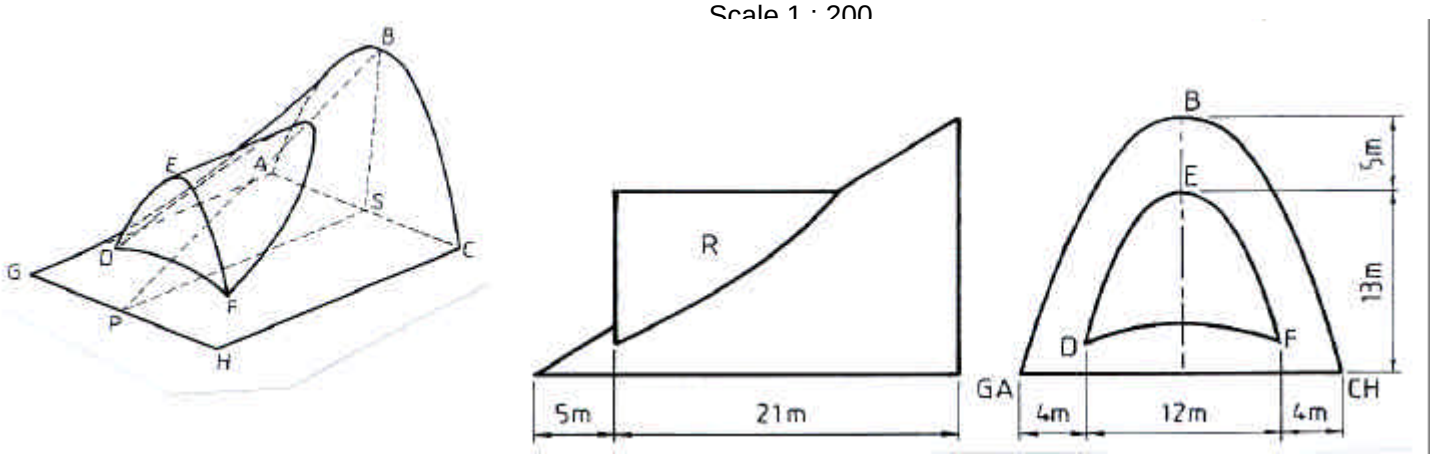


FIG. 4

5. On a contour map A and B are two points whose altitudes are 90 m and 70 m respectively. On the map B is located 90 m north-east of A. A skew bore-hole at A is drilled in a north-westerly direction in plan and has an actual inclination of 60° to the horizontal plane. It reveals the top and bottom surfaces of a stratum at altitudes of 50 m and 20 m, respectively.

A skew bore-hole at B is drilled in a south-westerly direction in plan and has an actual inclination of 50° to the horizontal plane. It reveals the top and bottom surfaces of the stratum at altitudes of 70 m and 45 m, respectively.

(a) Determine the dip, strike and thickness of the stratum.

(b) Another skew bore-hole at A is drilled in a northerly direction in plan and has an actual inclination of 65° to the horizontal plane. Determine the true inclination of this bore-hole to the stratum.

Scale 1 : 1000

6. Fig. 5 shows the outline plan and elevation of a roof. The hyperbolic paraboloid surfaces ABEF and BCDE are extensions of the smaller hyperbolic paraboloid surfaces AHGF and CDGH, respectively. The roof perimeter is a regular hexagon in plan.

(a) Draw the given plan and elevation and project an end elevation.

(b) Determine the curvature of the roof along a line from A to D.

(c) Determine the traces of the plane director for the edges AH and FG of the surface AHGF and having its horizontal trace passing through A.

Scale 1 : 200

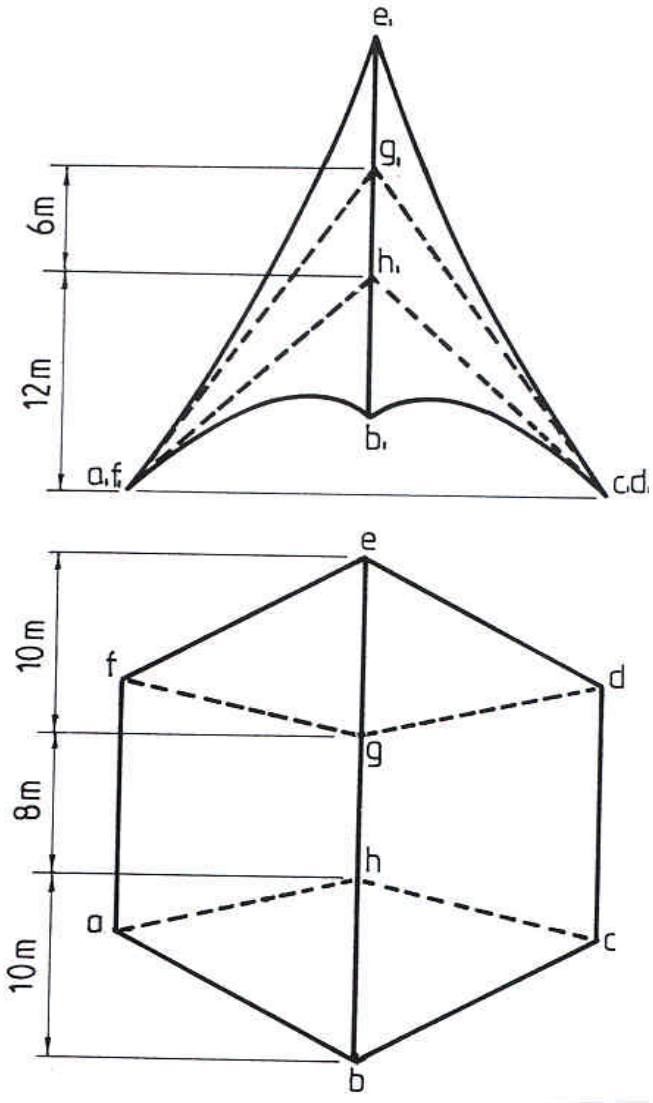


FIG. 5

7. The accompanying drawing shows ground contours at five-metre vertical intervals. ABCD is the line of a proposed roadway. The roadway has the following specifications:-

(i) formation width from A to C is 15 m; from C to D the road is widened as shown;

(ii) formation level at B is 55 m;

(iii) gradient A to B is 1 in 10 rising; gradient B to D is 1 in 15 rising;

(iv) side slopes for cuttings 1 in 2;

(v) side slopes for embankments 1 in 1.5.

On the drawing supplied, show the earthworks necessary to accommodate the roadway.