WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Advanced Certificate of Education

TECHNICAL DRAWING

GEOMETRICAL DRAWING

Paper 1

3 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of two sections, A and B with a total of eight questions

Answer five questions, with at least two questions from each section.

All questions carry equal marks.

A sheet of drawing paper, size A2 is provided. Use both sides of the drawing paper.

Drawings are not to scale.

Unless other wise stated in the question, strictly geometrical methods must be used; but lines which are parallel, perpendicular, or inclined at angles of 30^0, 45^0, 60^0 to other lines which may be drawn without using constructional methods.

All dimensions of the figures are in millimeters.

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No dimensions are required on any solution unless specifically requested.

Write your name and examination number at the bottom right-hand corner of your paper.

SECTION A (PLANE GEOMETRY)

1. Construct a diagonal scale of 40mm to 1mm to measure up to 4mm.

   a) Indicate the following readings;

      i) 1.32mm

      ii) 2.76mm

      iii) 3.28mm   *(8marks)*

   b) Using a diameter of 1.32mm, construct a regular pentagon.   *(4marks)*

   c) Construct an involute of the pentagon constructed above   *(3marks)*

   d) Draw a normal and tangent to the involute at a point of convenience   *(5marks)*

2. The figure below shows a radial arm roller follower that is to be operated by a plate cam rotating in an anticlockwise direction the motion of the cam is as follows:
   Cam data:
   - Bottom dwell $0^0 - 60^0$
   - Rise through 60^0 with uniform acceleration and retardation from $60^0 - 150^0$
   - Dwell for the next 30^0 of cam rotation
   - Fall through 20^0 with uniform velocity for the next 60^0 of cam rotation
   - Fall to start position with simple harmonic motion.

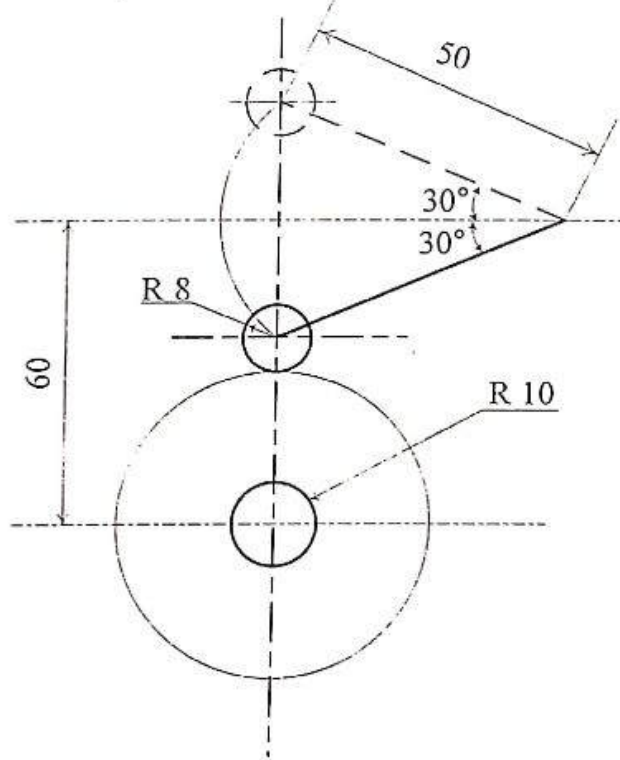   Plot the profile of the cam.   *(20marks)*

FIG.1

3. Construct 1 ½ turns of each helical spring using the following information.
   (omit hidden details in each case)
   a) External diameter of a spring = 70mm
      Pitch = 80mm
      Spring made from a 16mm diameter rod   *(10marks)*

   b) External diameter = 70mm
      Pitch 80mm
      Spring made from a 12mm square bar
      Right hand helix   *(10marks)*

4. The figure below is of a frame work. determine
   a) The magnitude of force in the reactions RL and RR.   *(08marks)*

   b) In tabular form, show the magnitude of force in each member and state whether it
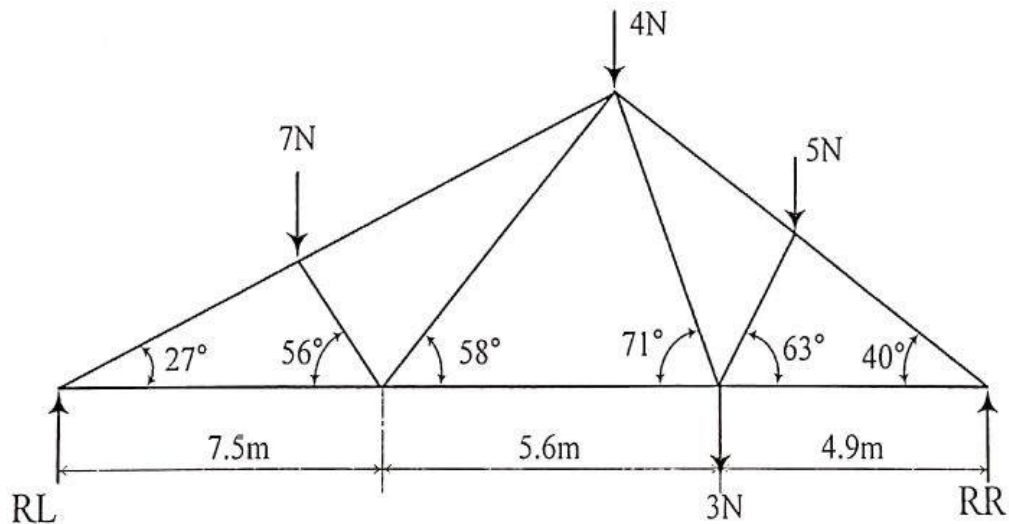   is a strut or a tie.   *(12marks)*

FIG. 2

SECTION B (SOLID GEOMETRY)

5. The figure below shows the orthographic projections of the machine block in third angle orthographic projection:

    i)   Construct the first auxiliary elevation on reference line X1 Y1.   (10marks)

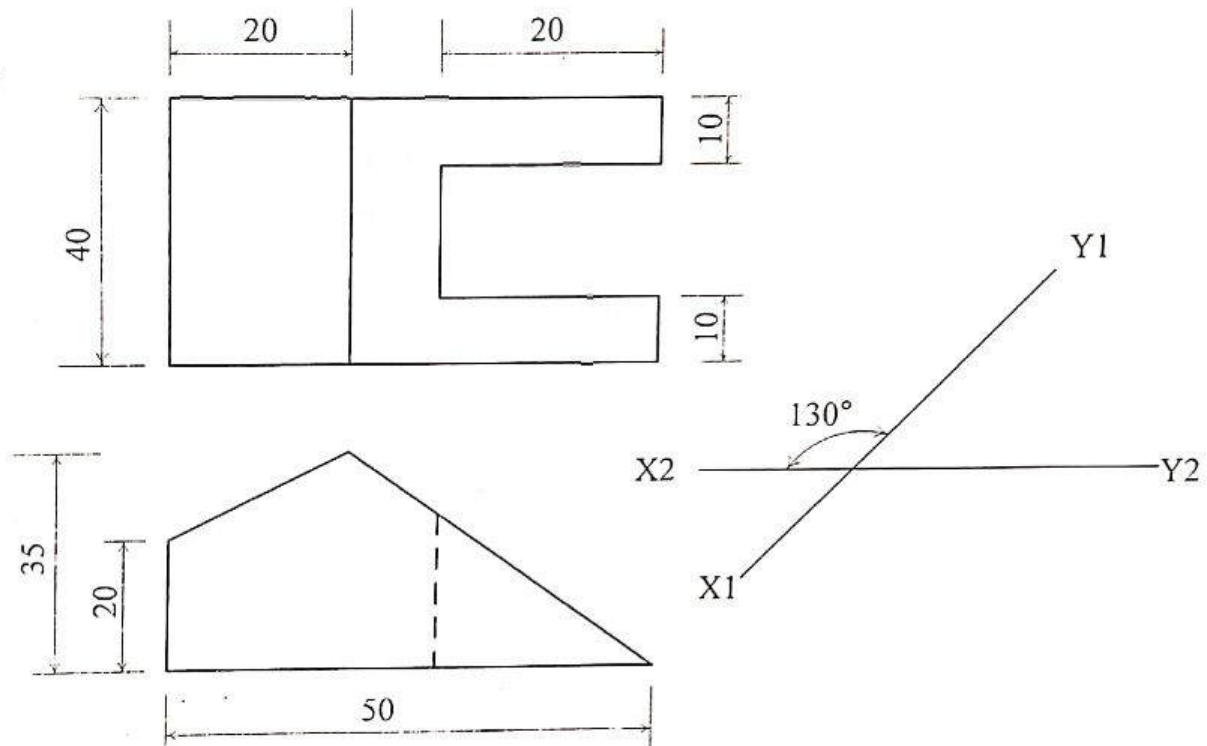   ii) Construct the second auxiliary plan on reference line X2 Y2.   (10marks)

FIG. 3

6. The figure below shows an oblique plane VTH cutting through a square based prism

    (a) Reconstruct the figure   (03marks)

    (b) Show the cut surface of the prism on the

        (i)   Plan   (07marks)

        (ii) Front elevation   (05marks)

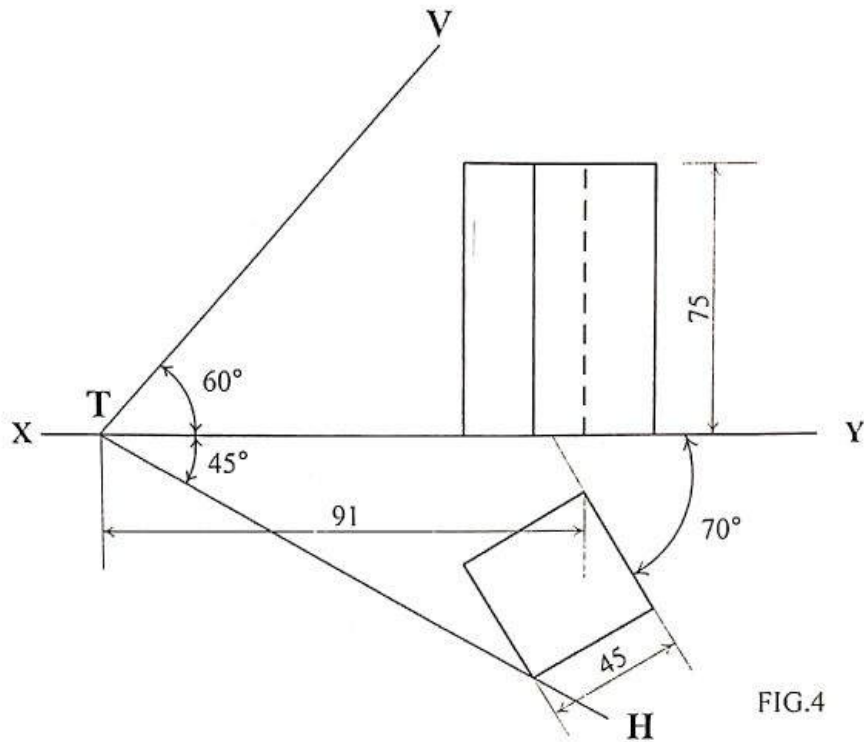   (c) Show by construction the true shape of the cut surface of the prism . (05marks)

FIG.4

7. The figure below shows the front elevation of a hexagonal based prism
   interpenetrating a cylindrical elbow.
   Construct the front elevation given
   (04marks)
   a) showing the curve of interpenetration clearly.
        i) Construct the plan showing clearly the curves of interpenetration.
           (08marks)
        ii) Construct the development of the prism after interpenetration
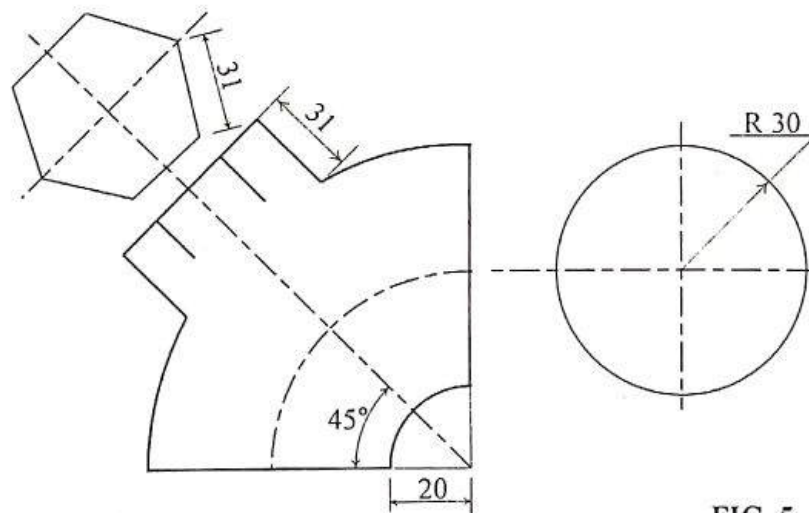   (08marks)

FIG. 5

8. Two views of a transition piece made in sheet metal are given below.

(a) Copy the given views. (03maks)

(b) Construct the development of the piece. Take **a - a** as the seam. (17marks)
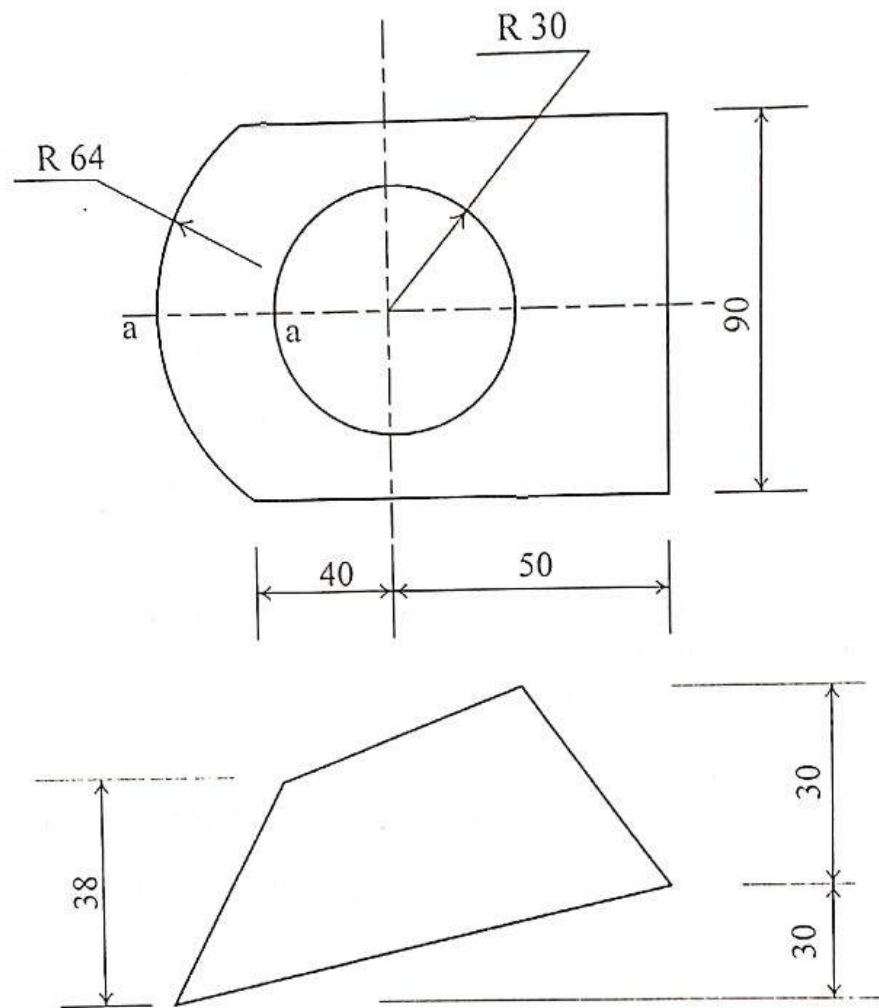

FIG.6

-END-

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GEOMETRICAL DRAWING

Paper 1

3 hours

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Answer **five** *questions, with* **at least two** *questions from each section.*

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Turn Over

SECTION I: PLANE GEOMETRY

1. The displacement curve for a radial cam to rotate clockwise at 40 Rev/min is shown incompletely drawn in fig.1 below. Complete the graph to the given scale and construct the cam profile if the roller follower is 20mm diameter with its line of action offset 32mm to the left of the vertical center line of the cam. The nearest approach of the roller center to the cam center is to be 40mm and the cam shaft diameter is to be 25mm.

R 8

Fall with UA

dwell

26 20 23 23

Lift with SHM   Fall with uniform retard.n

R 8

3/8   7/16   3/16   1/4   1/4
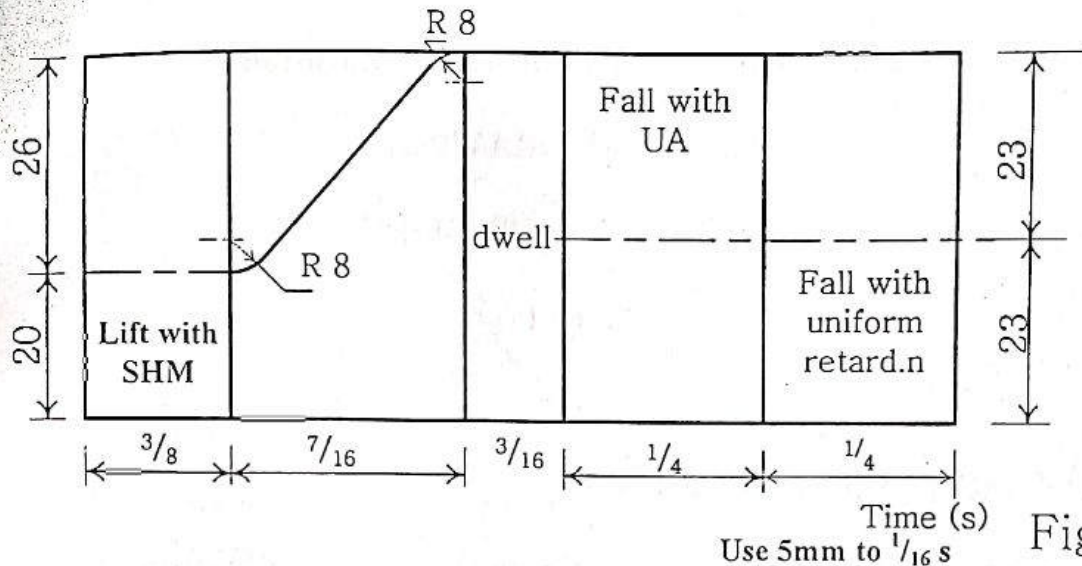
Time (s)
Use 5mm to 1/16 s   Fig.1

2. a) Figure 3 is of a 1.5m beam, having live loads of 4N, 6N, and a repulsive force of 2N as indicated in the figure. To suitable scales stated draw

   (i)   a space diagram

   (ii)   a polar diagram

   (iii)   a bending moment diagram

   (iv)   a shear force diagram

   (v)   also determine the value of the reaction at the hinge
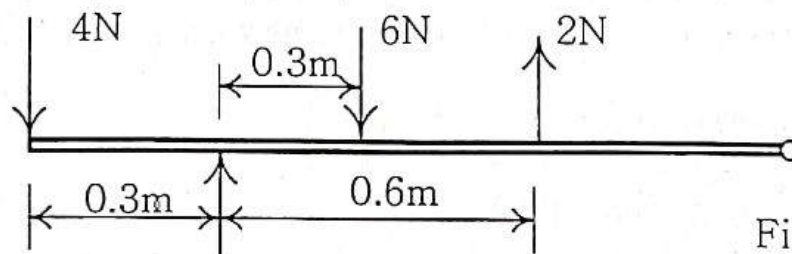

4N   6N   2N

0.3m

0.3m   0.6m

Fig. 2

b) A regular pentagon in figure 3 below has been used to show the positions of a non concurrent coplanar system of forces. Graphically determine the resultant force for the given non-concurrent coplanar forces shown
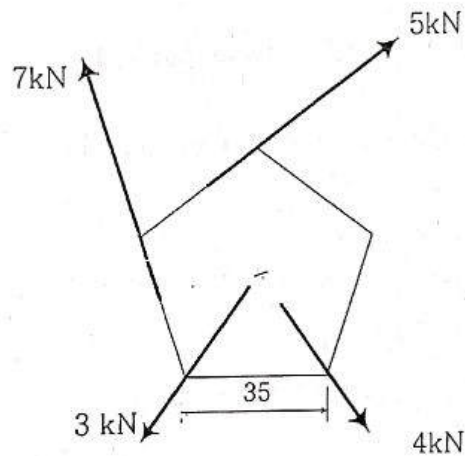

Fig. 3

3. Fig. 4 is of a linked mechanism designed that when crank OA rotates, crank DE oscillates as roller F slides along axis x - x.
Draw the motion formed by the mechanism when crank OA makes a complete revolution.
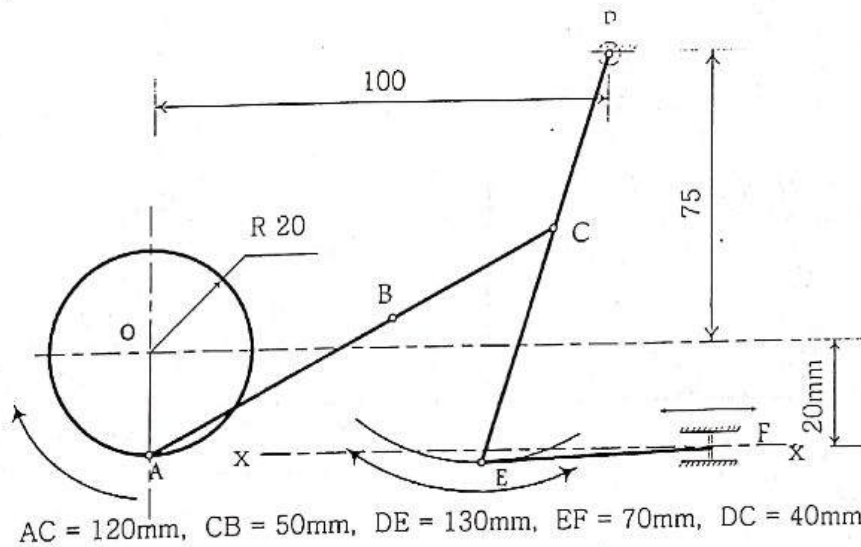a) plot the locus of B,
b) State the travel of F.

AC = 120mm, CB = 50mm, DE = 130mm, EF = 70mm, DC = 40mm

FIG. 8

4. Fig.5 shows a base circle of radius 90mm on which two generating circles of diameter 64mm and 34mm are placed internally and externally respectively.

a) Construct the locus made point X 15mm inside the generating circle with center **A**.   (8marks)

b) Construct the locus made point Y 14mm outside the generating circle with center **B**.   (8marks)

c) Name the locus formed in each case   (2marks)
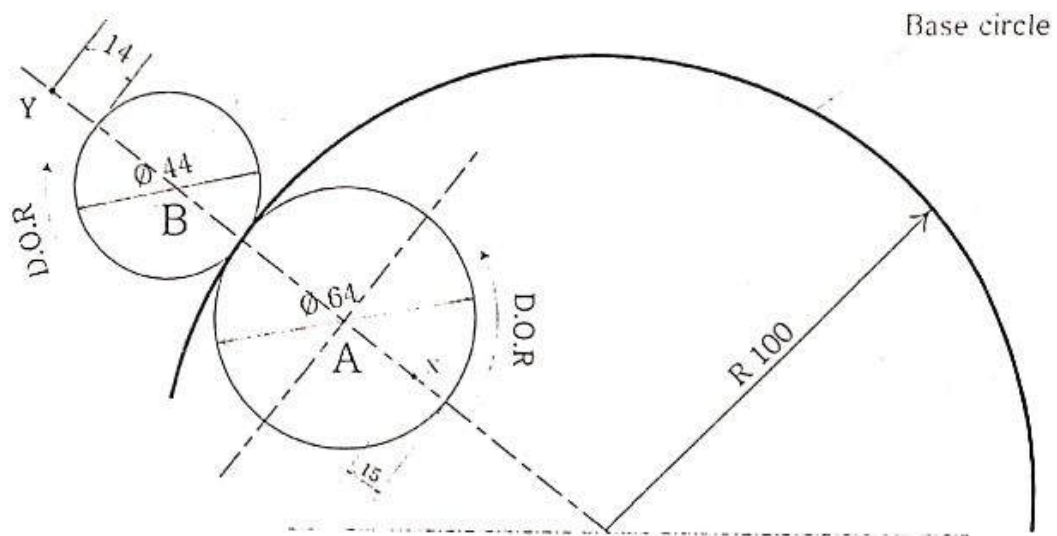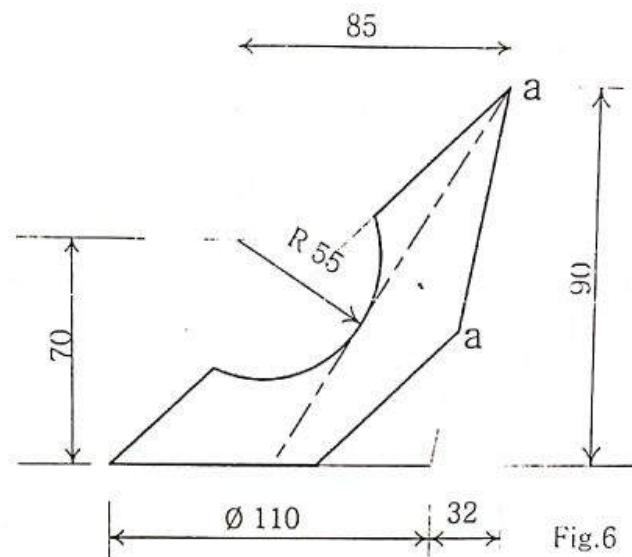
(Follow the direction of rotation (D.O.R) shown)

Fig.5

SECTION II: SOLID GEOMETRY

5. Make a full development of the transition piece shown in figure 6 making **a-a** the seam.

85

R 55

90

70

Ø 110

32

Fig.6

6. Two views of a component are given orthographic projection are shown in figure 7. With corner Q in the fore ground come up with an isometric drawing.

30

45

110

ellipse

46

48

15

Q

87

75

Fig.7
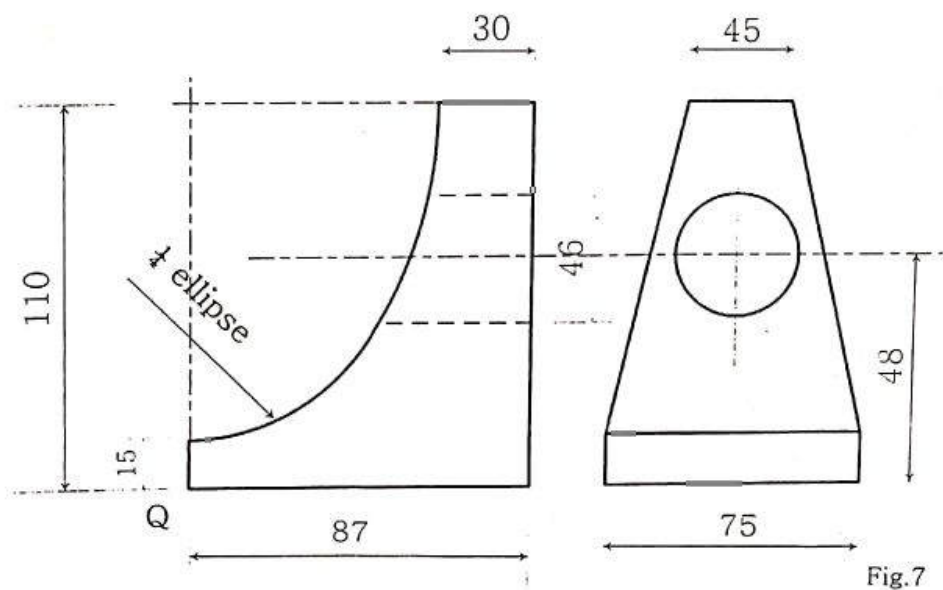
7. An elevation JKL of a lamina is given in fig. 8. The horizontal trace (H.T.) of the oblique plane in which the line rests is also given, while the true inclination of the plane to the horizontal plane (H.P.) is 49⁰.
Construct

Turn Over

a) the vertical trace (V.T.) of the plane
b) the plan of the lamina
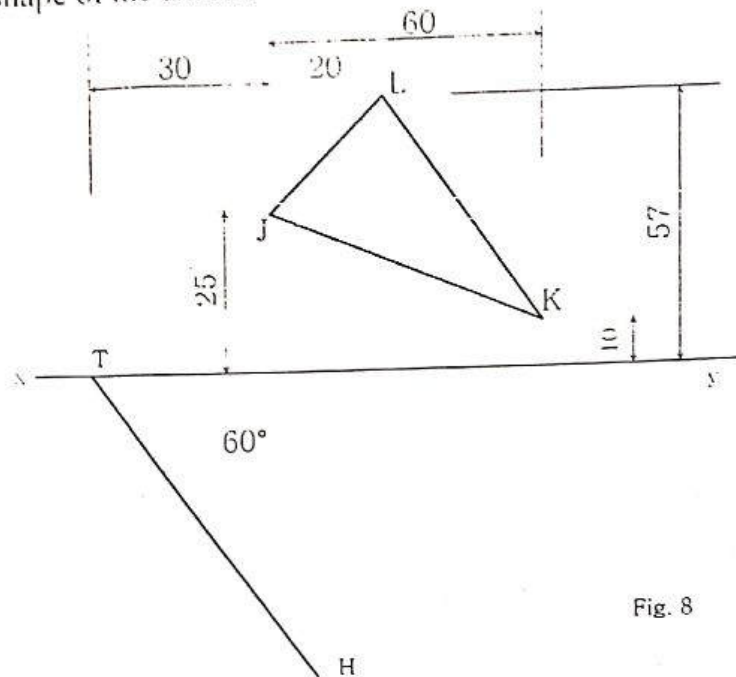c) the true shape of the lamina

Fig. 8

8. The drawing of the component in figure 9 is presented in first angle orthographic projection
   a) draw the given views (3marks)
   b) Project an auxiliary plan in the direction of the arrow P (9marks)
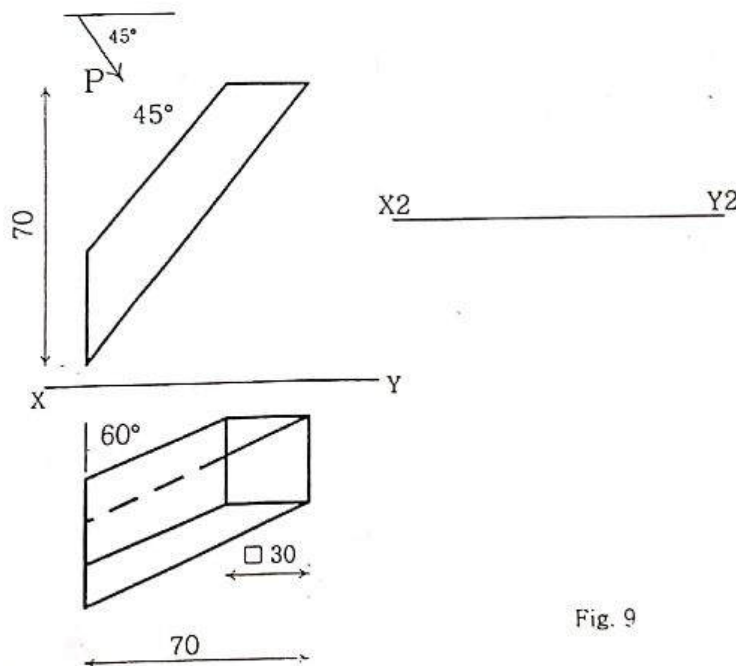   c) and a second auxiliary elevation on x2-y2 (8marks)

Fig. 9

-END-

P710/1 & P720/1
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- *All questions carry equal marks.*

- *Use the drawing paper, size A2 provided.*

- *Drawings are not to scale.*

- *All dimensions of the figures are in millimeters.*

- *All given figures are not drawn to scale.*

- *The answers to all questions must be drawn to the given dimensions.*

SECTION A: PLANE GEOMETRY

1. The mechanism shown in figure 1 is of a link mechanism in which crank OA rotates about A as the rod AB is constrained to move in contact with the surface of a fixed block D which has an effective radius of 60mm about a center Q and the rod AB is also pinpointed to another rod BC. BC slides along axis x-x. using the knowledge you have in geometrical drawing draw the locus formed by point P located on 40mm away from B on rod BC.

FIG. 1
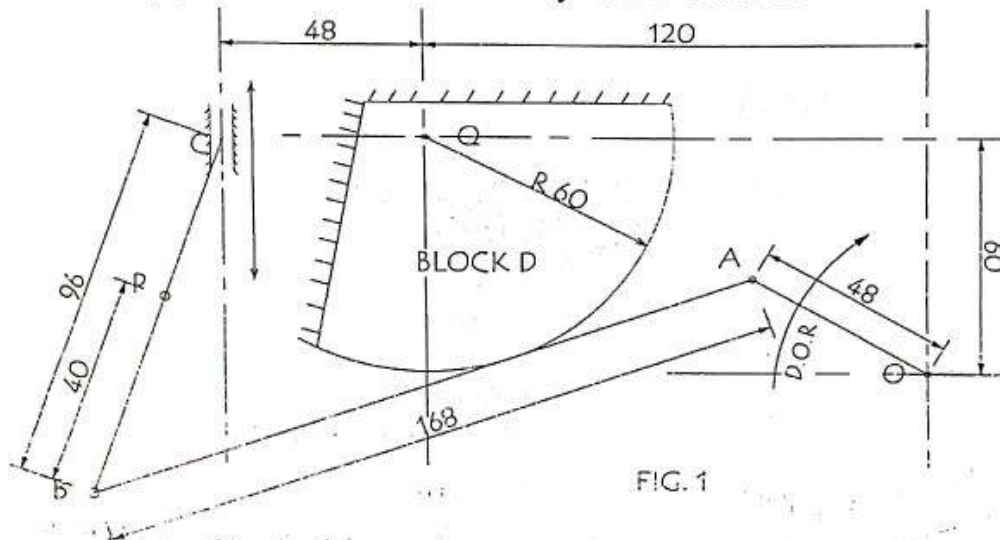
2. Figure 2 below is of a roof truss designed for a hospital path way that is proposed to be built at Nsambya Hospital. Using suitable scales.
   a) Draw the space diagram to a suitable specified scale   (06 marks)
   b) Determine the value of the reactions   (04 marks)
   c) Draw a Bending moment diagram   (04 marks)
   d) In tabular form find and state magnitude of forces in the members
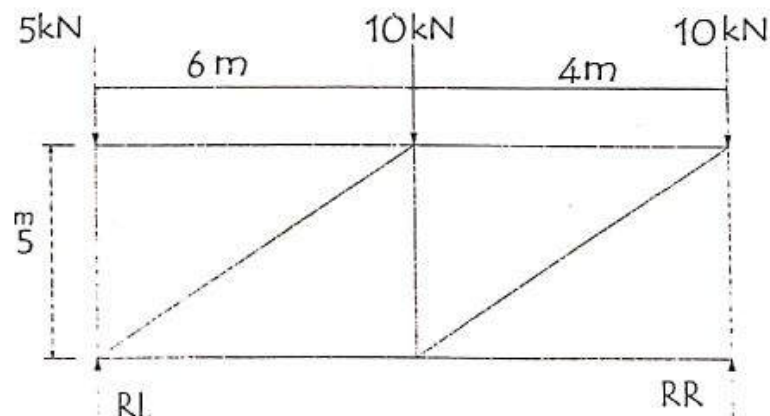   (06 marks)

FIG. 2

3. Figure 3 below shows a graph of motion of a plate cam designed to operate a roller follower of diameter 20mm which is offset 24mm to the right of the cam shaft center line and the shortest distance from the cam shaft center to the roller center is 32mm.

   a) To a suitable scale draw the graph motion.

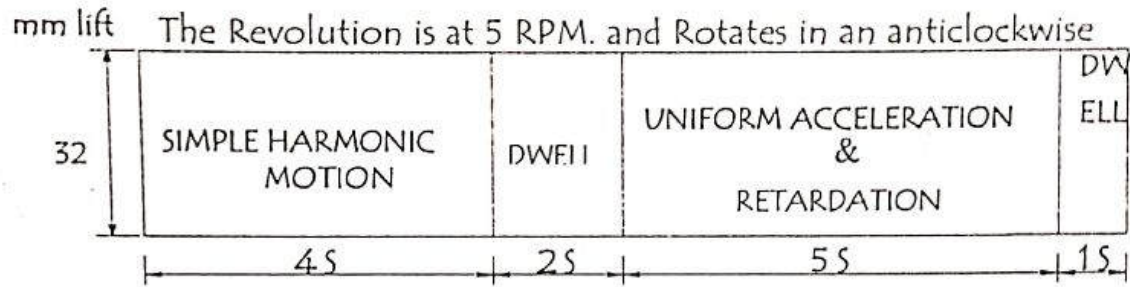   b) Design a cam profile to be satisfied by the graph.

mm lift   The Revolution is at 5 RPM. and Rotates in an anticlockwise

				DW ELL
32	SIMPLE HARMONIC MOTION	DWELL	UNIFORM ACCELERATION & RETARDATION	
	4S	2S	5S	1S

FIG. 3

4. a) Construct a plain scale of 30mm to 1m to read up to 5m in steps of 100mm. (04 marks)

   b) Enlarge the scale drawn in (a) above to a new scale in the ratio of 5 to 3. (04 marks)

   c) i) Using the enlarged scale drawn in (b) above, construct the hexagon shown in fig.4 (08 marks)

      ii) Reduce the hexagon in the ratio of 3:5 by side. (04 marks)
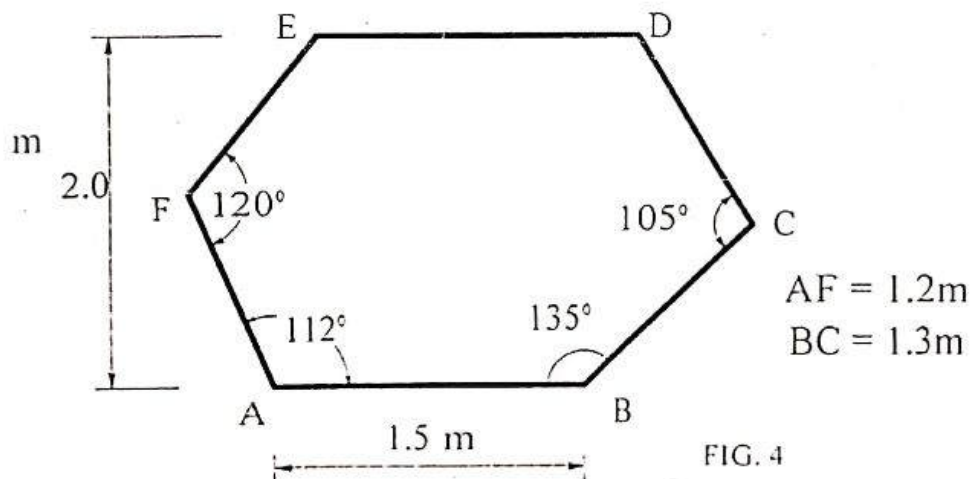

AF = 1.2m
BC = 1.3m

FIG. 4

SECTION B. (SOLID GEOMETRY)

5.   Fig.5 is of a 38mm square prism interpenetrating an oblique cone of diameter 86 and height 75mm drawn in third angle orthographic projection.

   i)   Draw the given views.   (4 marks)

   ii)   Make projections and show curves of intersection in both the front and the plan views.   (16 marks)
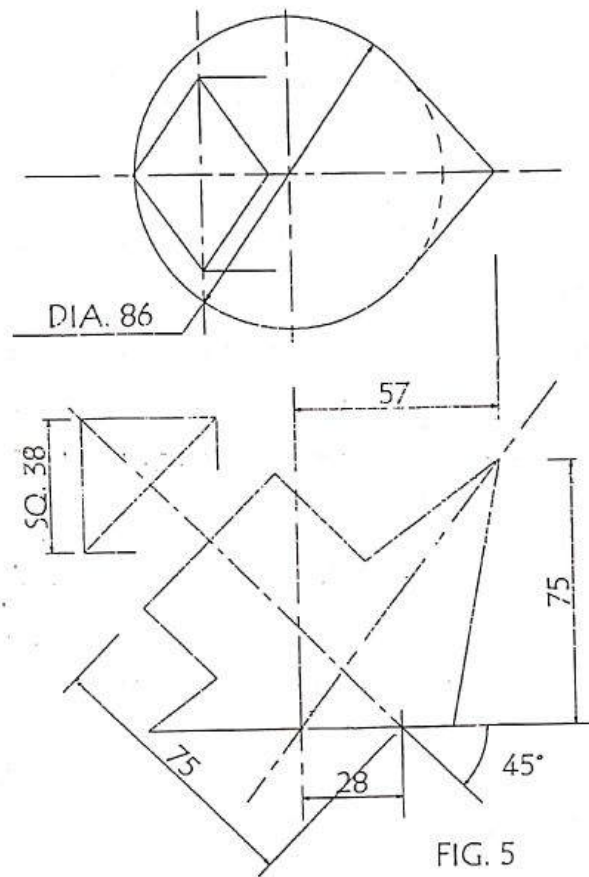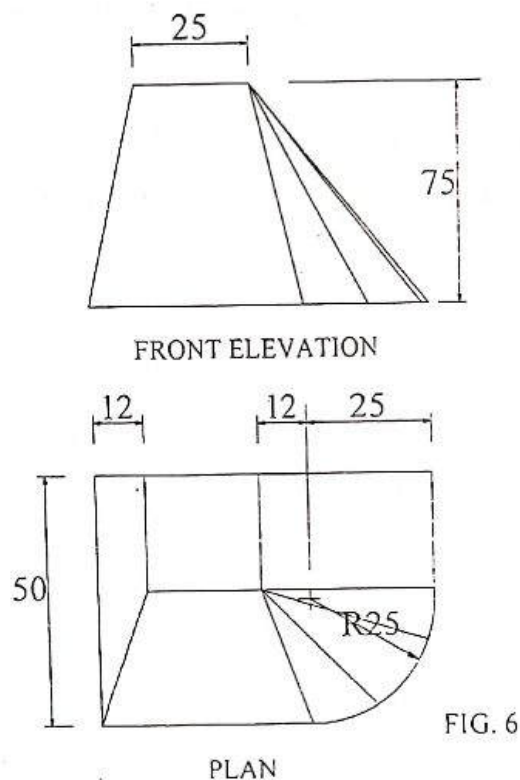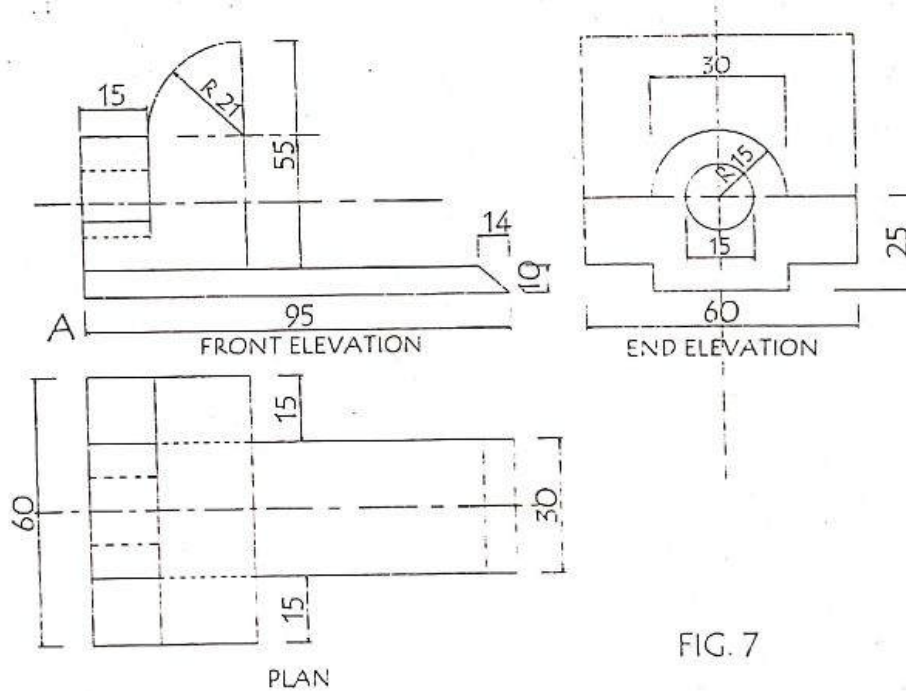

FIG. 5

6. The fig 6 is of the orthographic projection of a transition piece

   a) Draw the given views.

   b) Draw a development of the transition piece with the seam at S - S.

25

75

FRONT ELEVATION

12   12 25

50

R25

FIG. 6

PLAN

7. Draw the fig. 7 below is isometric projection with corner A in the fore ground.

15   R 21   55

14

19

A   95
      FRONT ELEVATION

30

R15

15

25

60
END ELEVATION

15

60   30

15

FIG. 7

PLAN

8. Given in fig.8 is a regular hexagonal vent duct designed to carry smoke in the roof of a kitchen. The roof is pitched at 60^0 and 30^0 as shown in the figure below.

a) Project an auxiliary plan in the direction of arrow Y.
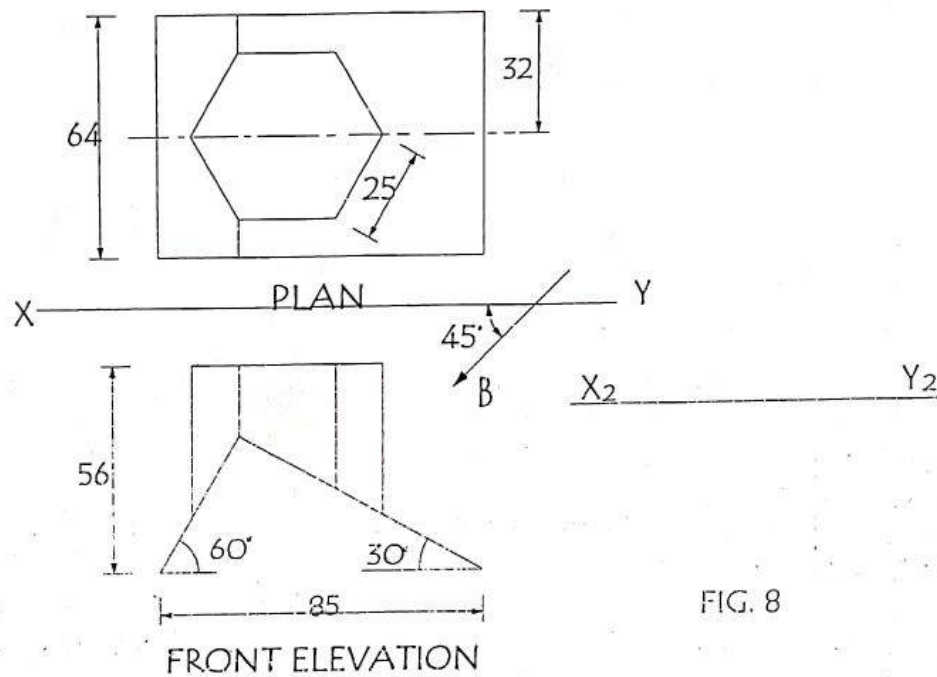
b) Project a second auxiliary elevation on $X_2 Y_2$.

PLAN

FRONT ELEVATION

FIG. 8

END