

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA
MATRICULATION EXAMINATION
INTERMEDIATE LEVEL
SEPTEMBER 2015

SUBJECT:	ENGINEERING DRAWING AND GRAPHICAL COMMUNICATION
DATE:	5th September 2015
TIME:	4.00 p.m. to 7.00 p.m.

Directions to Candidates

Write your **index number** where indicated **at the top** of **all** Drawing Sheets.

Only scientific calculators may be used. Programmable calculators are **NOT** allowed.

Unless otherwise stated:

- B.S. or equivalent (ISO) recommendations should be adopted throughout your answers;
- all dimensions are in millimetres, unless otherwise stated;
- all answers are to be accurately drawn with instruments;
- all construction lines must be left in each solution;
- drawing aids may be used.

Dimensions not given should be estimated.

Careful layout and presentation are important.

Marks will be awarded for accuracy, clarity and appropriateness of constructions.

Colour/shading may be used where appropriate.

Section A: Attempt any **FOUR** questions from five.

Section B: Attempt any **ONE** question from two.

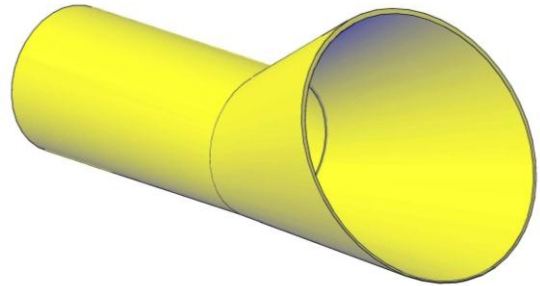
Section C: Attempt any **ONE** question from two.

SECTION A

Attempt only **FOUR** questions from this section.

Question 1

Part of an oblique cone (shown resting on its slant height in Figure 1a) is sectioned at the top end and is connected to a 40mm cylindrical pipe. The base of the cone is also sectioned (refer to the elevation in Figure 1b for details of the cone section).



**FIG. 1 a
(13 marks)**

- a) Copy, full size, Figure 1b.
- b) Complete the plan and the end elevation.
- c) Find the true lengths of the lines drawn on the surface of the oblique cone.
- d) Using the triangulation method, construct the surface development of the transition piece labelled 'A'.

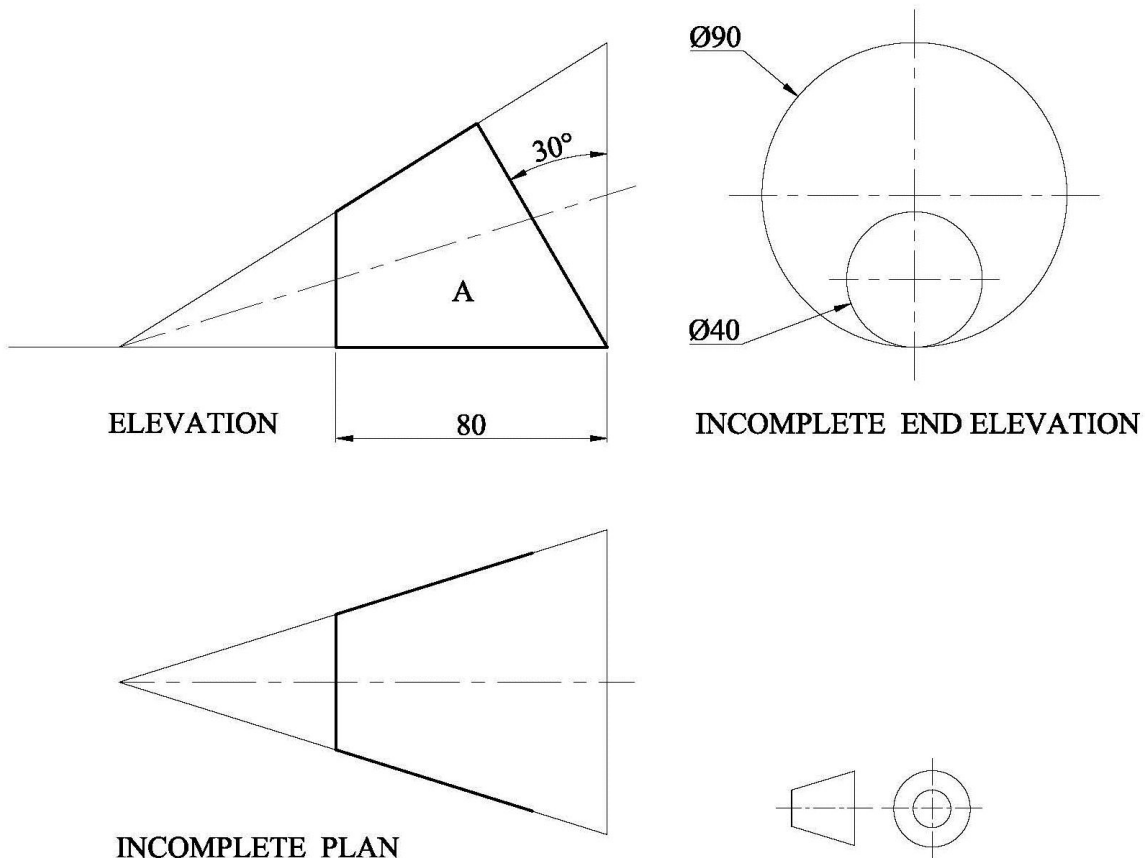


FIG.1b

Question 2

In the mechanism shown in Figure 2 the pitch circle of the crank CD is twice the pitch circle of the smaller crank AB. As a result, the smaller gear rotates twice while the larger gear rotates once and in the opposite direction.

Draw, full size, the given mechanism shown in Figure 2 and construct:

- a) The locus of the point E for one complete revolution of the crank CD
- b) Determine the length of the stroke of the piston F
- c) Draw the piston displacement diagram for the first 150 degrees of rotation of the crank AB.

(13 marks)

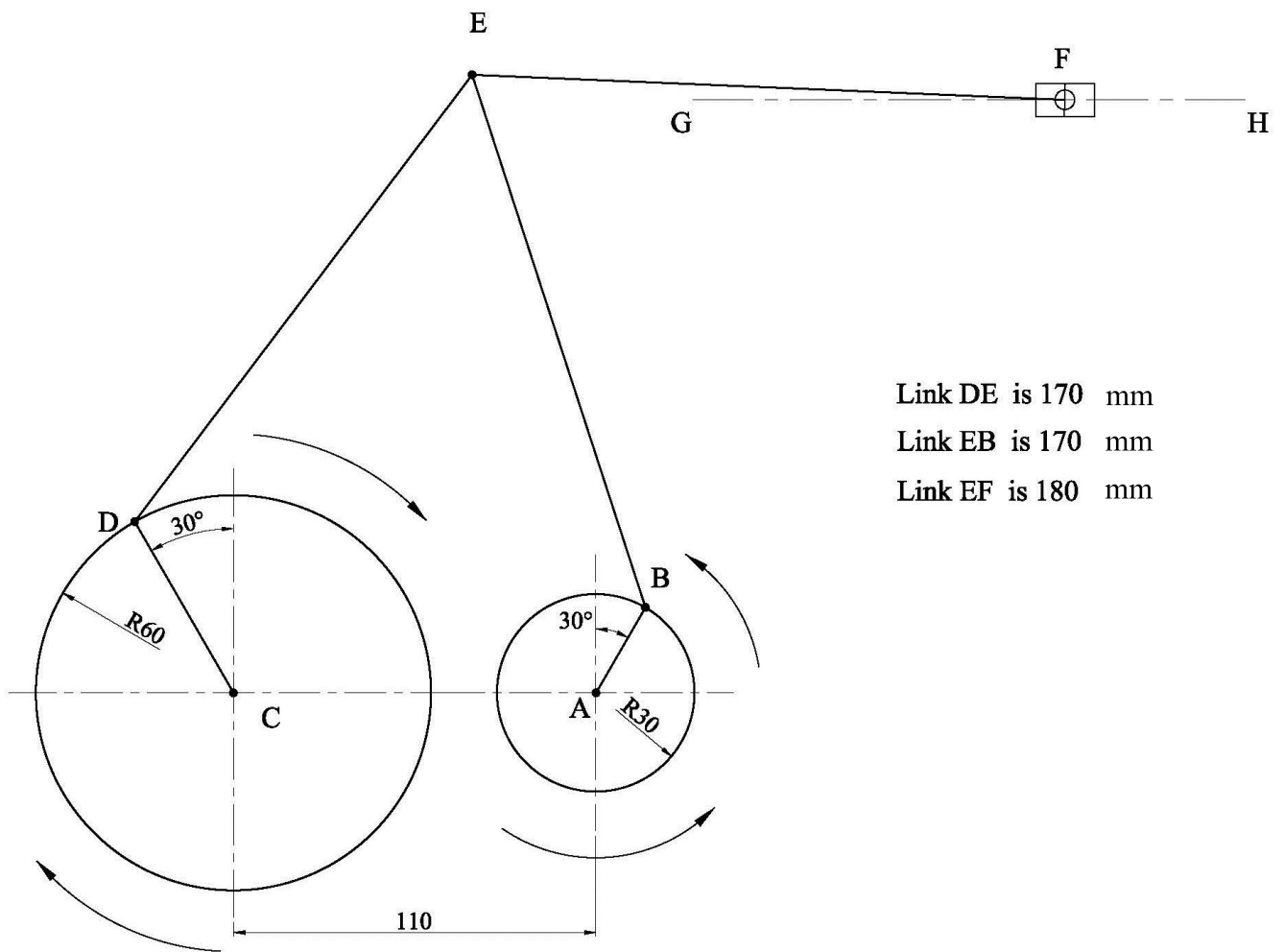


FIG. 2

Question 3

A sectioned square prism resting on its base is shown in Figure 3a. Details of the section are shown in the elevation of Figure 3b. An inclined square prism is to intersect two sides of the vertical square prism.

- a) Copy, full size, the partial plan and front elevation, together with the auxiliary view showing the square prism and the edge view of the smaller prism, shown in Figure 3b.
- b) Construct the line of intersection on the plan and front elevation.

(13 marks)

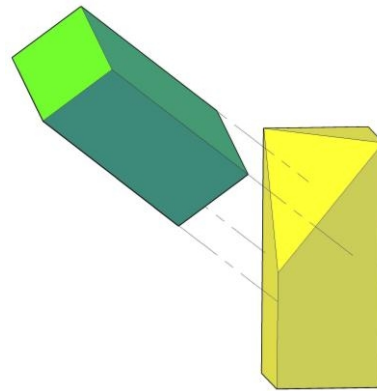


FIG. 3a

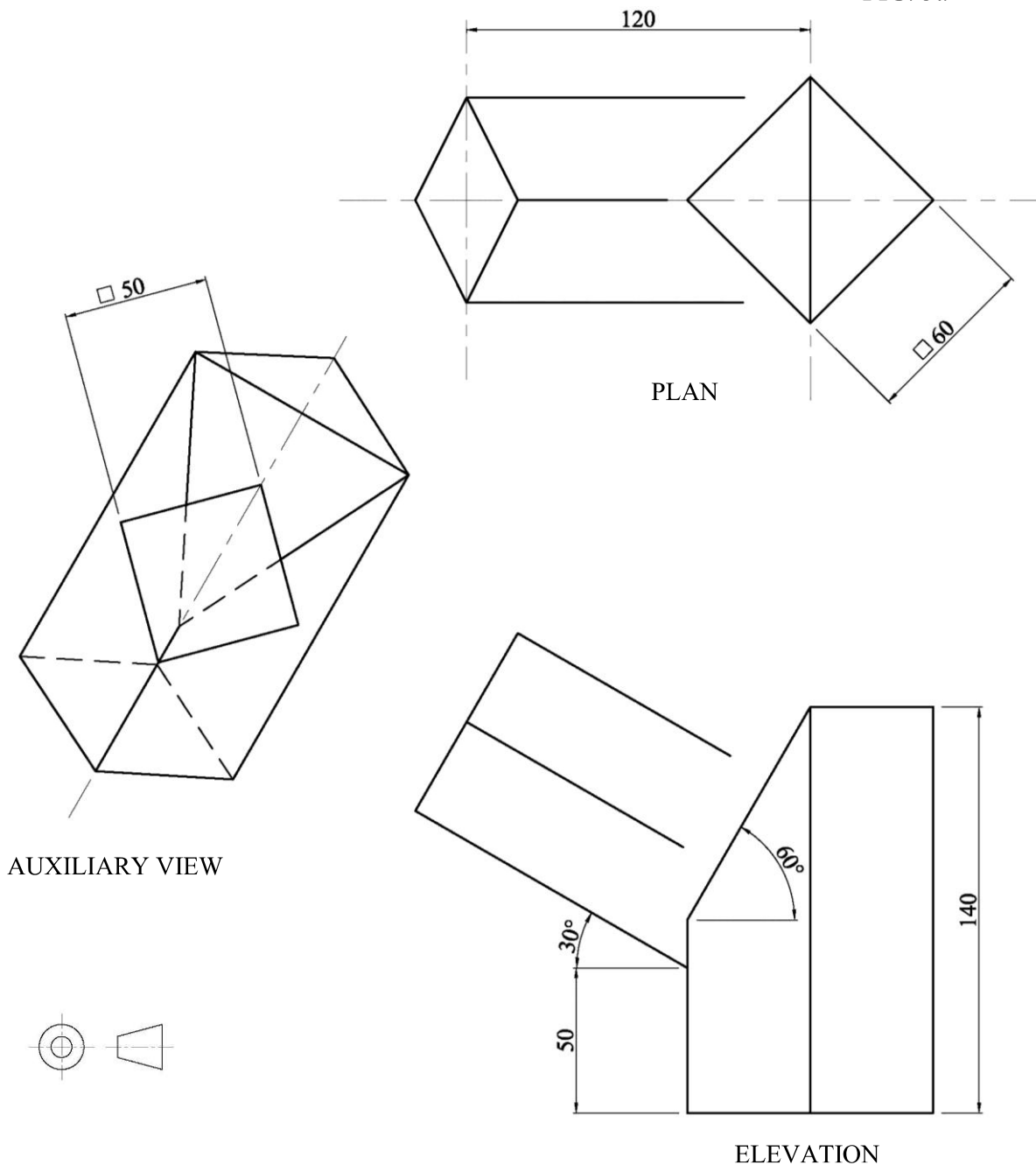


FIG. 3b

Question 4

The illustration in Figure 4a shows a crystal set arrangement on a table in a living room. It consists of a table lamp with a spherical ended conical shade, a spherical goblet next to it and a spherical shaped decorative glass touching the other two items.

- Draw, full size, the plan and elevation of the dimensioned table-lamp and shade given in Figure 4b.
- Construct the elevation and plan of the goblet in mutual contact with the table-lamp shade. Indicate the points of contact.
- Show, by using clear construction, the glass in mutual contact with the table-lamp shade and the goblet. Indicate the points of contact on both views.

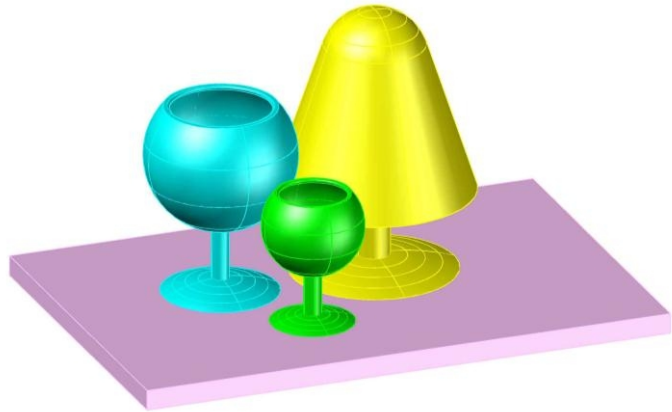


FIG. 4a

Note: Represent the table-lamp as a right cone, the goblet and the glass as a sphere.

(13 marks)

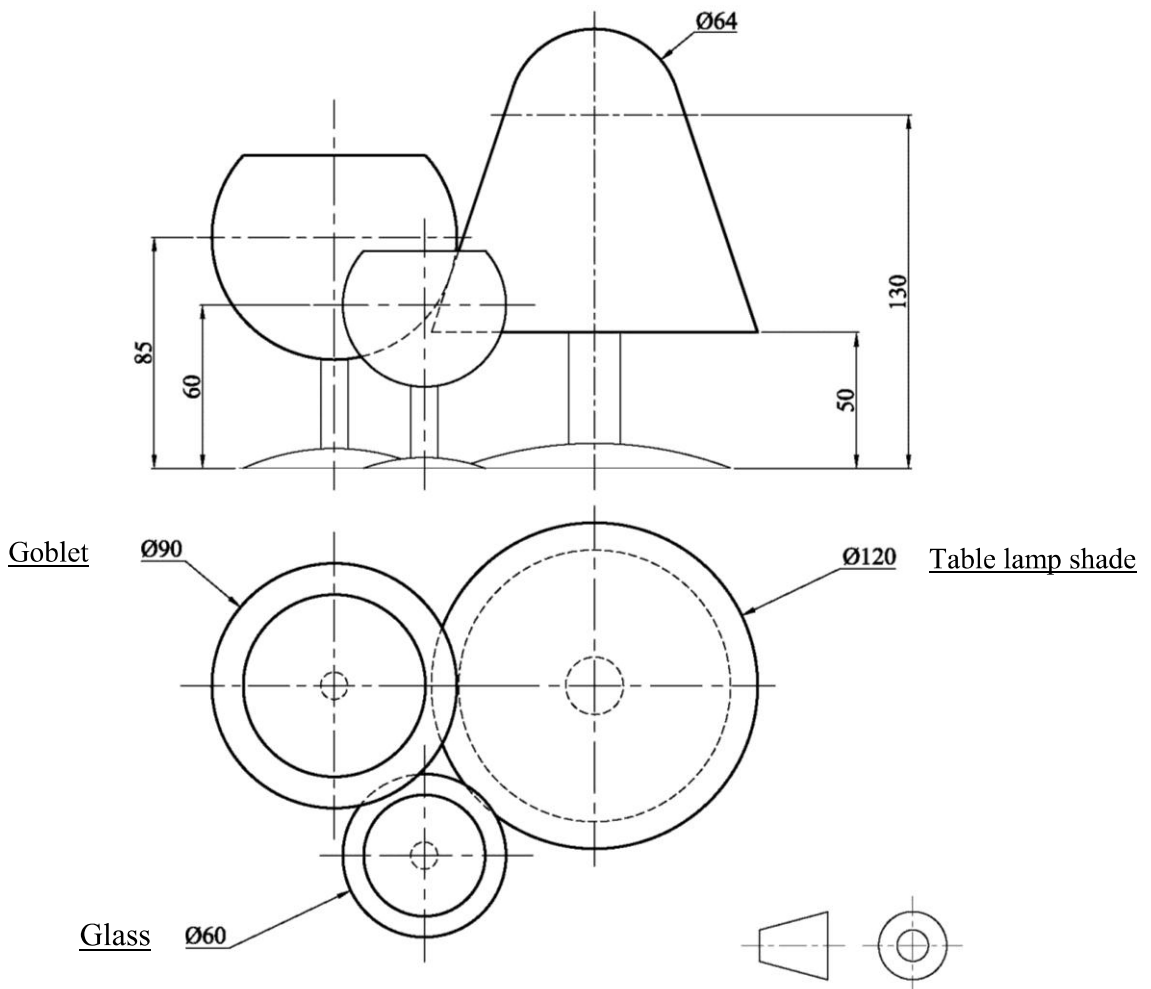


FIG. 4b

Question 5

The supports of a light beam are positioned at the ends and is loaded as shown in Figure 5. Draw the space diagram and determine graphically:

- a) the shear force diagram;
- b) the bending moment diagram;
- c) the values of the reactions R_L and R_R ;
- d) the position of the resultant/equilibrant from the left reaction.

Notes:

- Use a scale of 10mm representing 1 metre to draw the space diagram.
- Use a scale of 10mm representing 1kN to draw the vector diagram.

(13 marks)

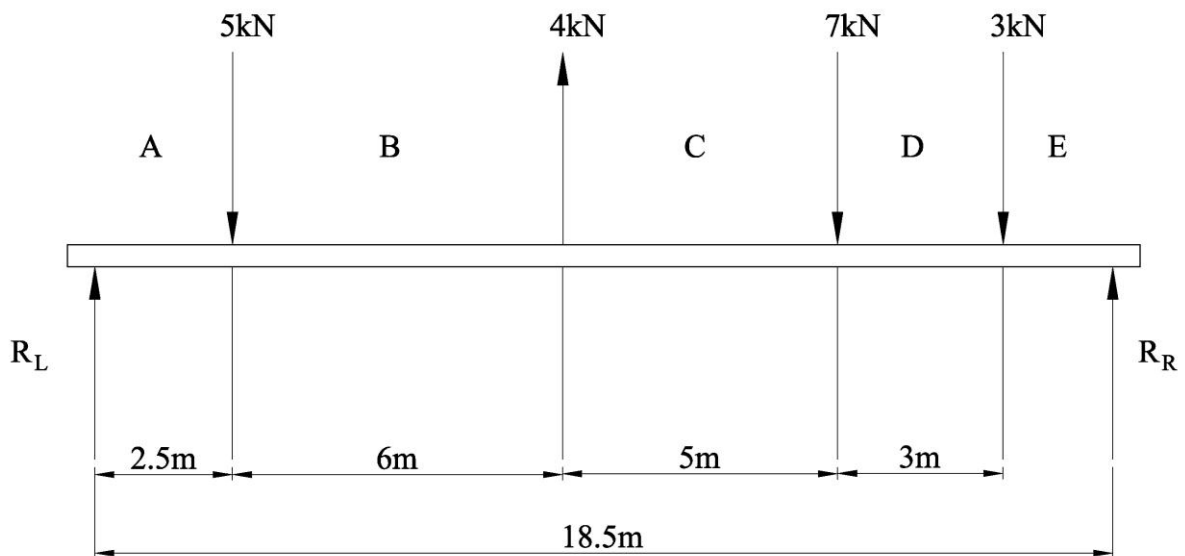


FIG. 5

SECTION B

Attempt only **ONE** question from this section.

Question 6

An exploded view of a Pivot Support is shown in Figure 6a. Details of the separate components are given in Figures 6b and 6c on the attached A3 sheets.

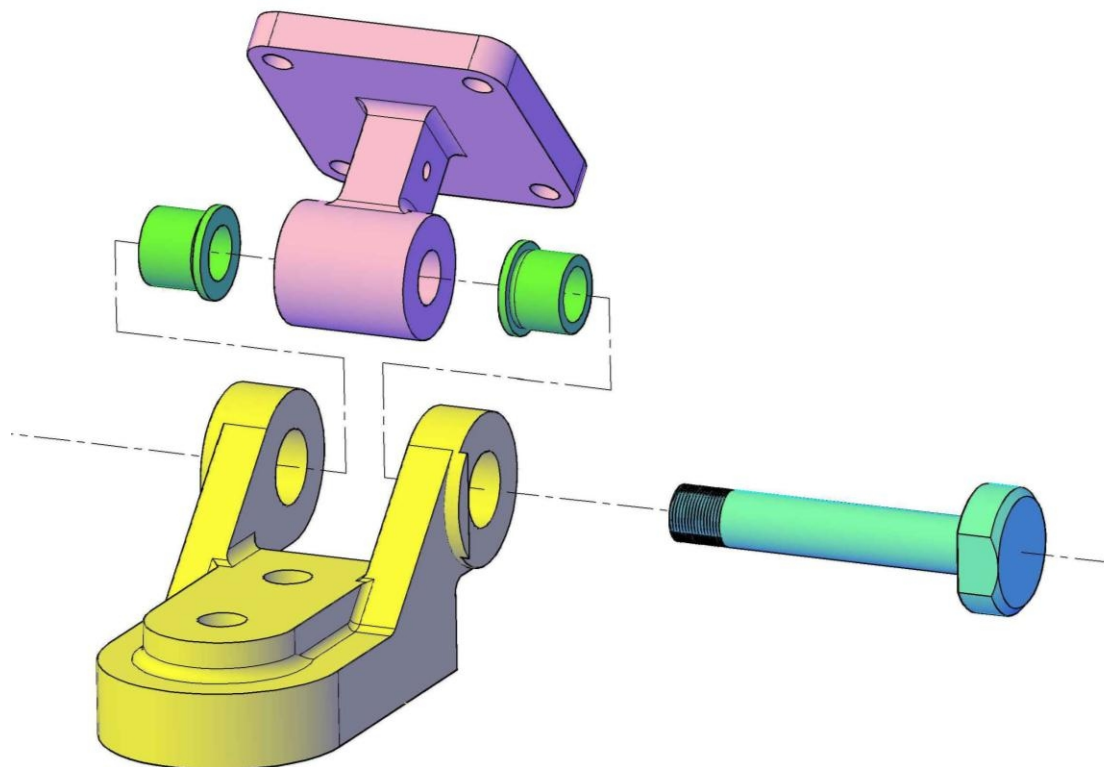
The bronze bush (item 2) fits into the 50mm diameter hole of the body (item 1) with the face marked P in contact with the inner side of the body lug face P as indicated in Figure 6b. The other bronze bush (item 3) fits into the other 50mm diameter hole of the body with the face marked Q in contact with the inner side of the body lug face Q. The support casting (item 4) is located between the lugs of the body casting. A steel bolt secures the support to the body. A segment is machined on the bolt head and is to rest against flat machined part of the body, to prevent the bolt from rotating. A standard hexagonal nut and washer (not shown) enables the assembly to be clamped in any desired position.

Draw full size, a sectional front elevation of the assembled Pivot Support. The viewing direction is indicated by the arrows A-A.

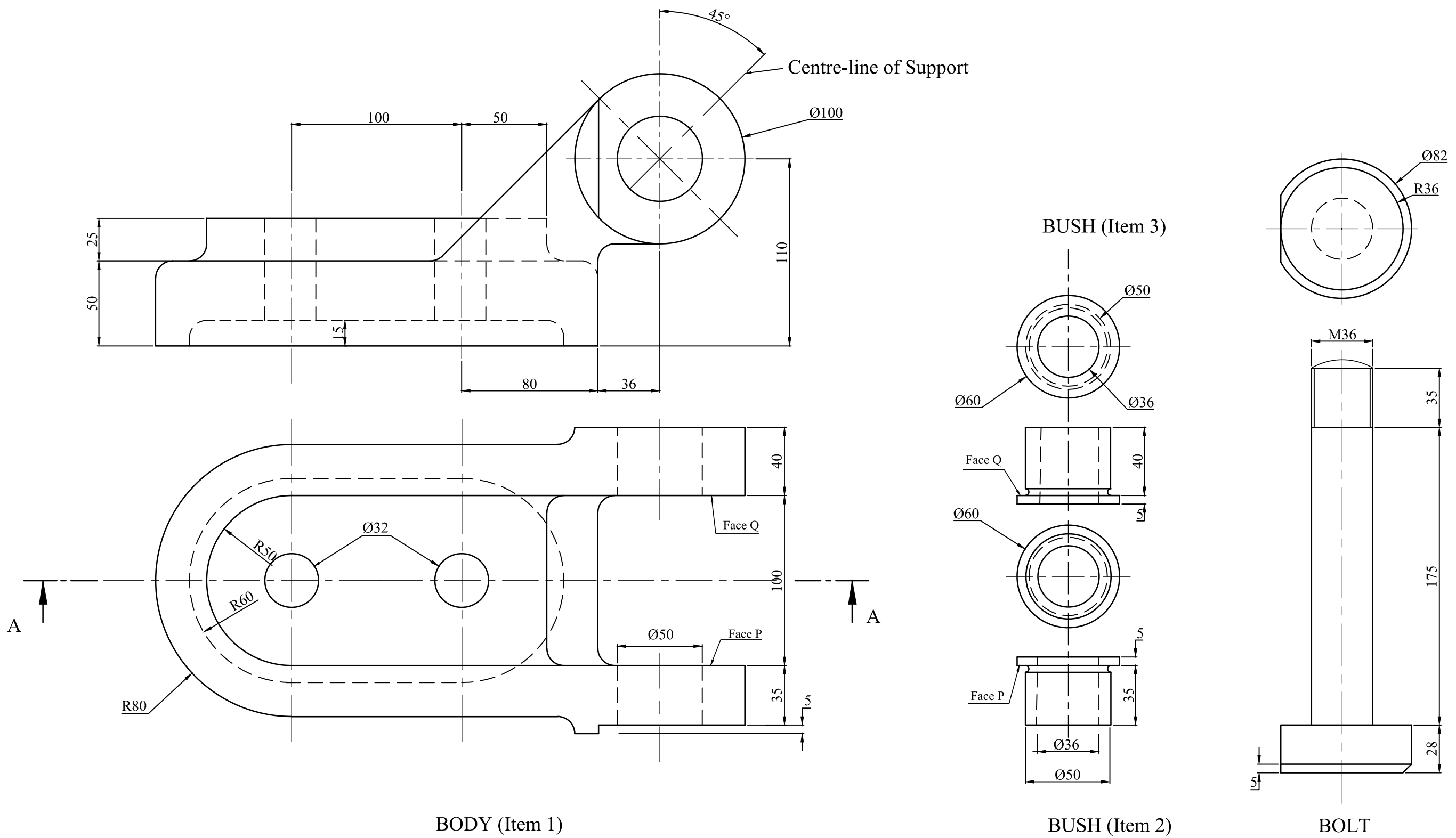
Notes:

- *The support is to be shown fastened to the body with its centre-line inclined at 45°, as indicated in the elevation of the body, in figure 6b.*
- *Do not show any hidden details.*

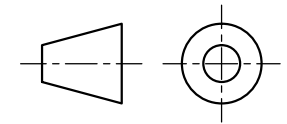
(24 marks)

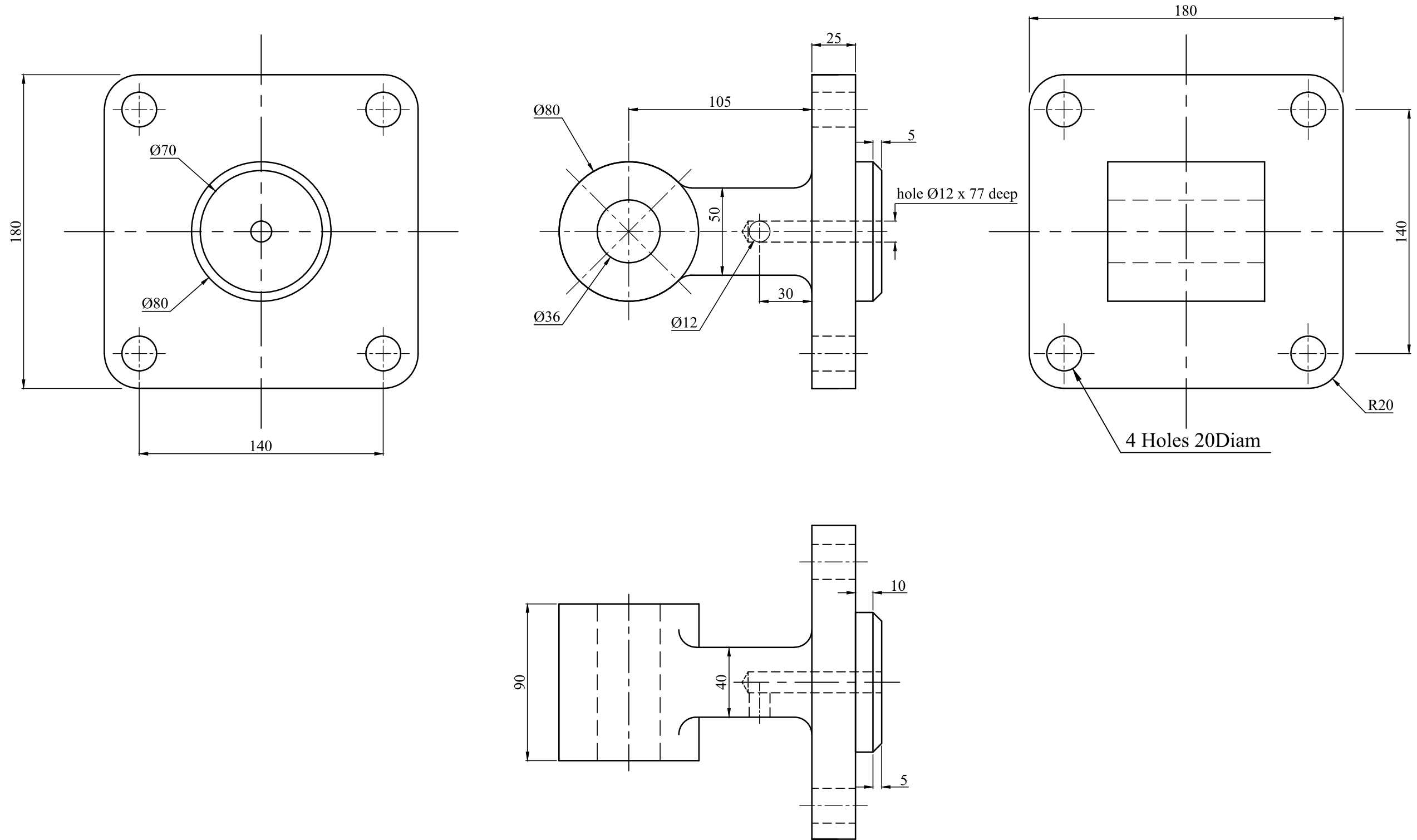


EXPLODED VIEW OF THE PIVOT SUPPORT
FIG. 6a

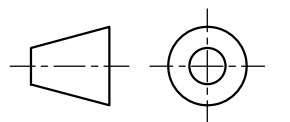


PIVOT SUPPORT





SUPPORT (Item 4)



Question 7

Orthographic views of a shaft with a keyway and a pulley with a key slot in the hub are shown in Figure 7b. A parallel key is to be attached to one member between the shaft and the hub of the pulley to transmit motion and to permit axial movement.

- a) Draw, an isometric view of:
 - i. The hub with a quarter of the pulley sectioned off showing how the keyway and the key are assembled.
 - ii. The installed shaft with the key seat visible on the top side of the shaft.
- b) Name the type of key used.

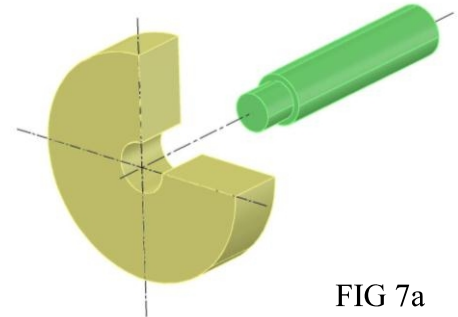


FIG 7a

Notes:

- Details and dimensions of the key are not shown in Figure 7b.
- Figure 7a gives a vague indication of your solution.

(24 marks)

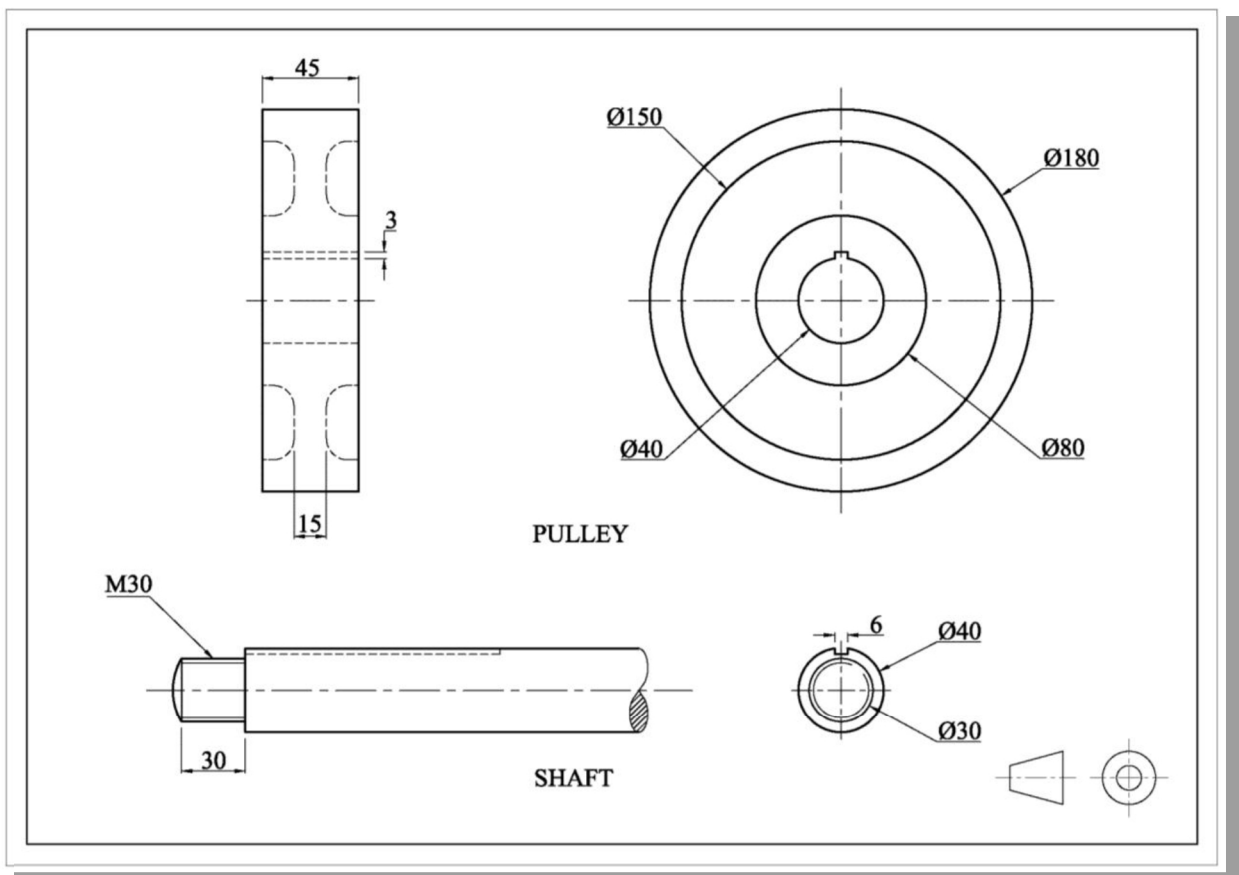


FIG. 7b

SECTION C

Attempt only **ONE** question from this section.

Question 8

The two orthographic views given in Figure 8 are part of an instruction manual of a newly designed coffee maker.

A coloured **three-dimensional drawing** to illustrate the general appearance of the coffee maker is required.

Your task is to:

- Draw a well-proportioned pictorial freehand sketch of the coffee maker.
- Colour and shade the drawing, paying particular attention to the representation of different materials and textures.

Notes:

- The visible upper part of the coffee maker is made of coloured plastics, indicator lamps and panel switches.*
- The lower part is made of polished stainless steel.*

(24 marks)

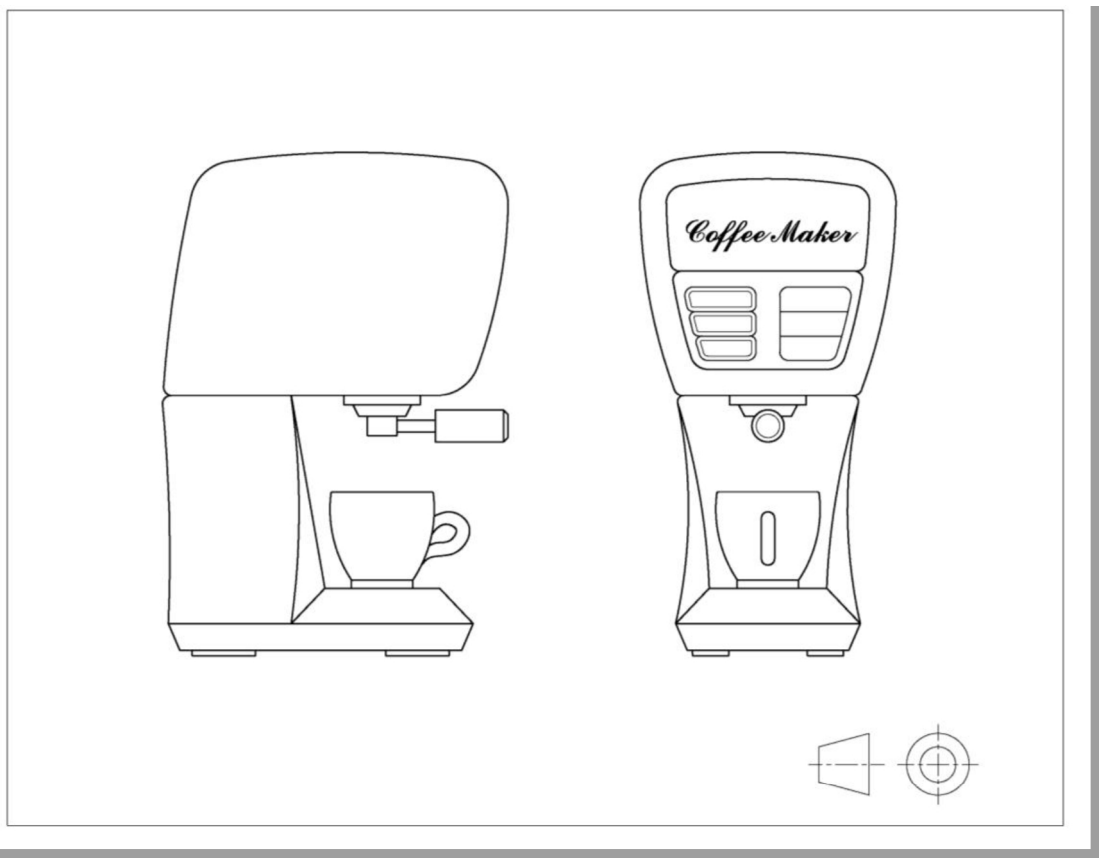


FIG. 8

Question 9

The plan and front view of a table tennis room are shown in Figure 9b. The rectangular room has five windows and a doorway that leads to a flight of steps. The furniture, which is also shown in Figure 9a, consists of a painted wooden table tennis table (A), eight benches (B), one presentation table (C), a hanging trophy show case (D) and two small notice boards. The drop ceiling is made up mainly of square mineral fibre panels. Three of the panels are translucent panels fitted with light fixtures. The size of the panels is three times larger than the floor tiles.

Using a scale of 30mm representing one floor tile, construct an estimated **single-point perspective** view of the table tennis room.

Notes:

- *The height of the courses is equal to the tile measurement.*
- *The viewing direction is indicated by the large arrows at the bottom of Figure 9b.*
- *The suggested vanishing point is indicated in Figure 9b.*
- *Render your drawing to enhance the solution.*

(24 marks)

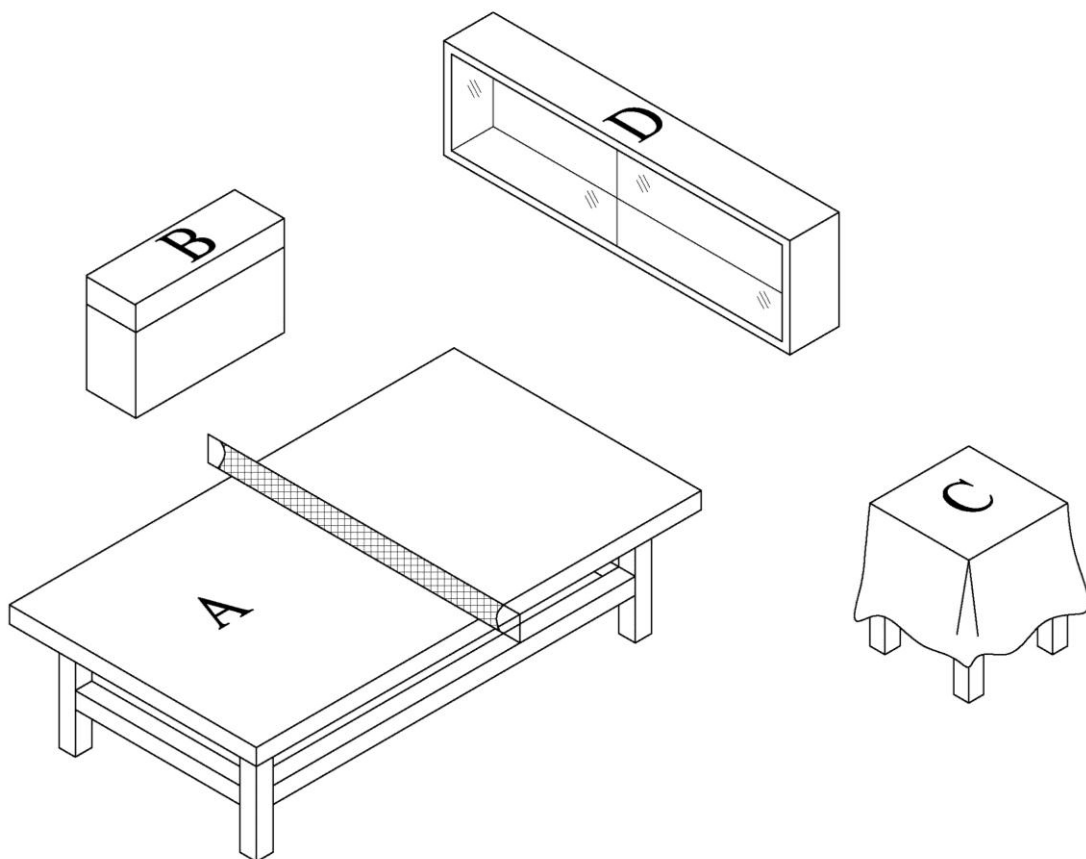


FIG. 9a

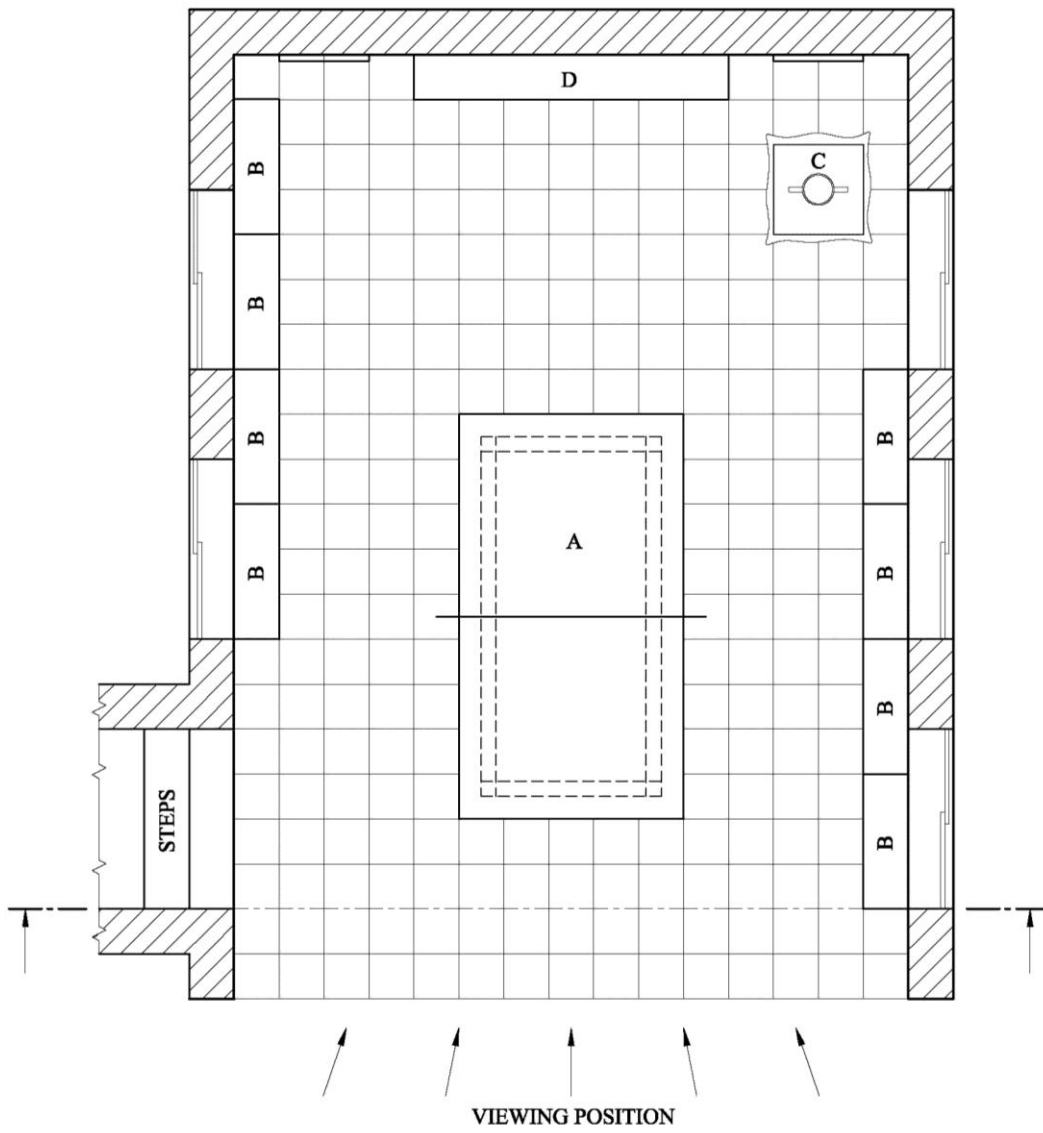
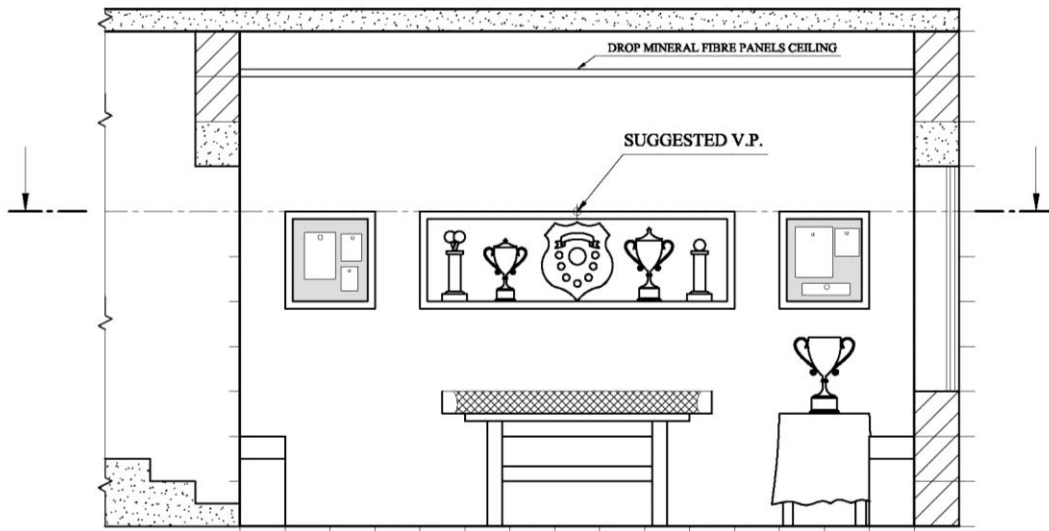


FIG. 9b