

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
SEPTEMBER 2017

| | |
|----------------------|---|
| SUBJECT: | ENGINEERING DRAWING/GRAPHICAL COMMUNICATION |
| PAPER NUMBER: | I |
| DATE: | 4 th September 2017 |
| TIME: | 9.00 a.m. to 12.05 p.m. |

Directions to Candidates

Write your index number where indicated at the top of all drawing sheets.

Attempt any **FIVE** questions.

Programmable calculators cannot be used.

Unless otherwise stated:

- drawings should conform to B.S. or equivalent (ISO) standards;
- all dimensions are in millimetres;
- all answers are to be accurately drawn with instruments;
- unless otherwise stated, 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.

1. Figure 1 shows a loaded horizontal cantilever beam securely built-in at the wall. The cantilever carries a point load, a uniformly distributed load of 1.5 kN per metre for a length of 3 metres and a point load at its free end.
 - a) Copy the linear (space) diagram, showing the loading along the cantilever shown in Figure 1. Use a scale of 30 mm to represent 1 metre. Use a clear notation system to identify the loads acting on the cantilever (3)
 - b) Using a force scale of 10 mm representing 1kN and a polar distance of 100 mm construct:
 - i. shear force diagram; (6)
 - ii. bending moment diagram. (6)
 - c) i. State the bending moment scale for 1 mm of ordinate. (2)
 - ii. From the scale data and the diagrams, determine graphically, the nature and magnitude of the greatest bending moment. Show all calculations. (3)

(Total: 20 marks)

SPACE DIAGRAM

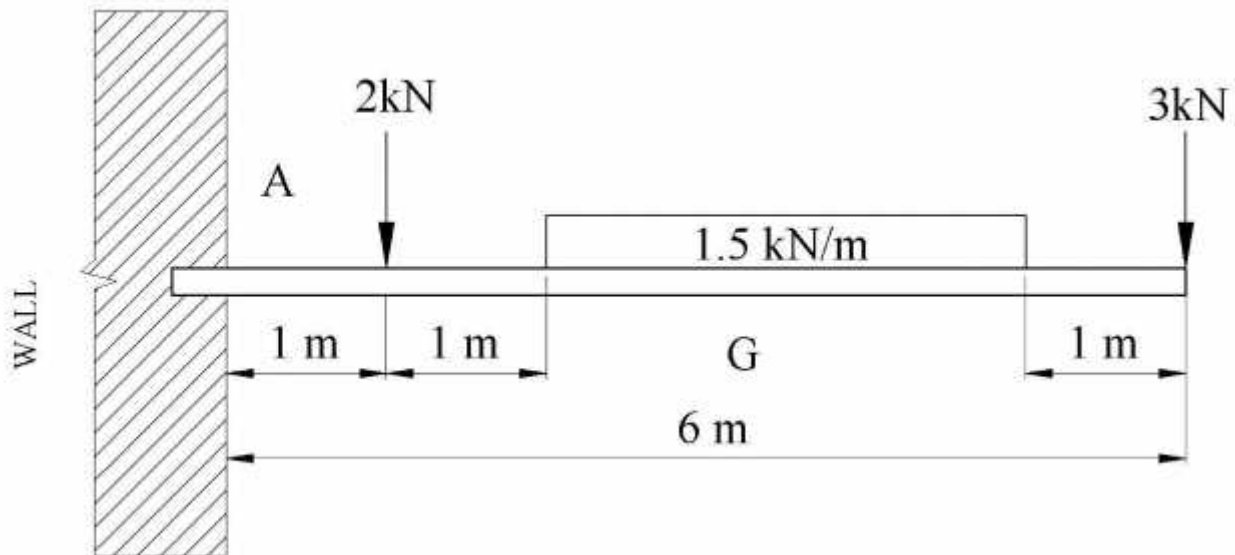


Figure 1

2. A transition piece suitable for connecting a cylindrical pipe to a rectangular duct is illustrated in Figure 2a.

- a) Copy, full size, the two views shown in Figure 2b. (3)
 - b) Generate construction lines by dividing the two views into triangles. Use light fold lines and annotate the points. (3)
 - c) Using suitable geometrical construction, determine the true lengths of the lines required (4)
 - d) Construct a half surface development of the transition piece by using the triangulation method. (10)
- Assume the seam to be along the line 1 - a.

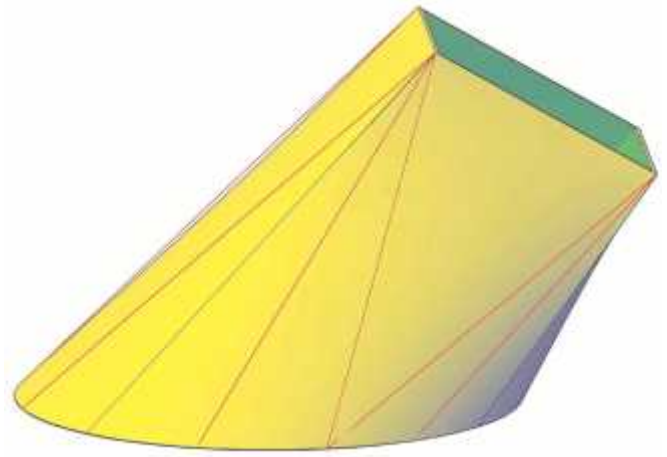


Figure 2a

(Total: 20 marks)

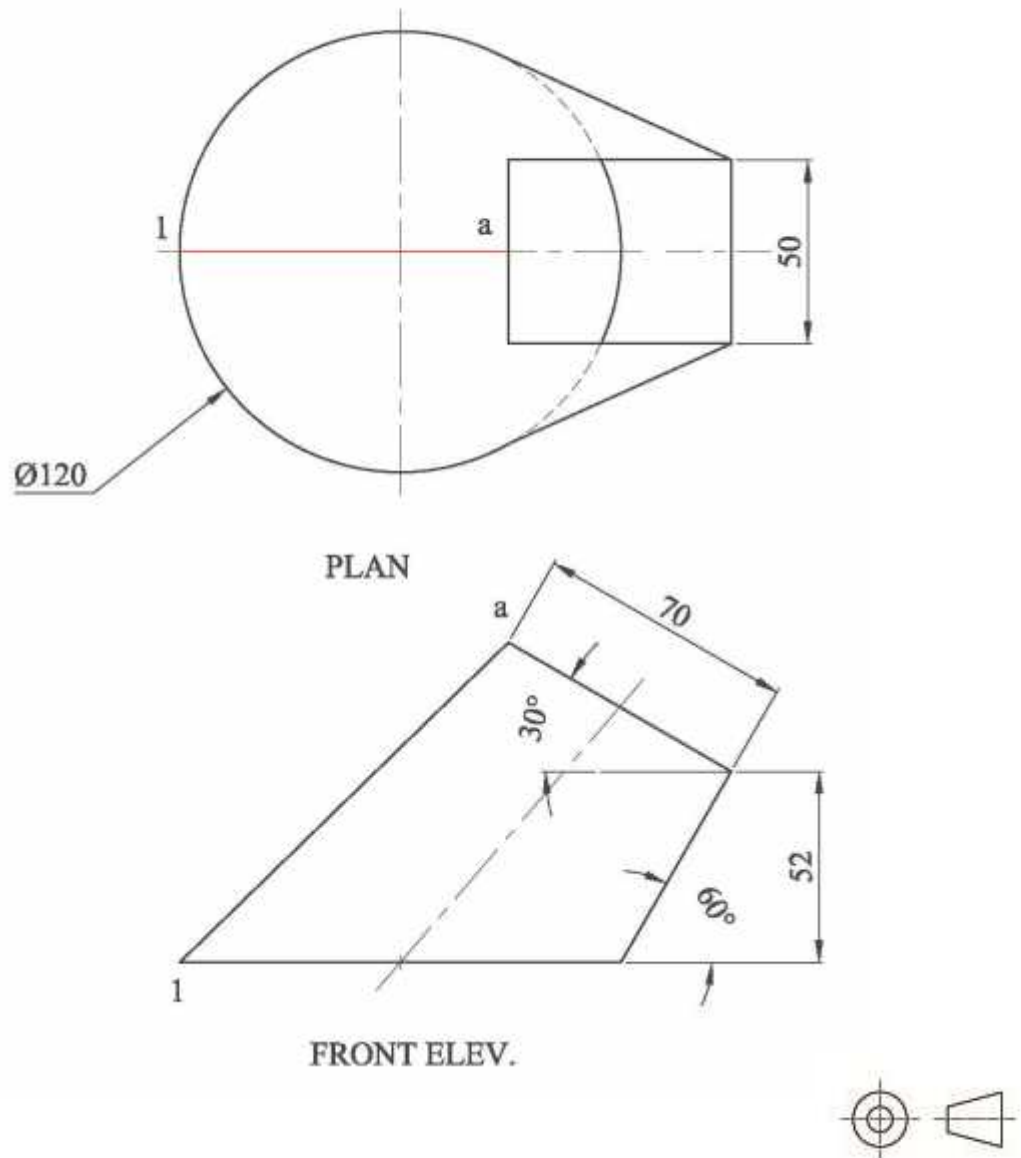


Figure 2b

3. A design feature representing a walk way structure for a pond is illustrated in Figure 3 a. Create a copy of the illustration by:

- a) constructing the hyperbolic curve A shown in Figure 3b, using an eccentricity of 5:3. Locate the position of the focus when the vertex is 36 mm away from the directrix; (5)
- b) drawing the elliptical curve B shown in Figure 3b, using an eccentricity of 3:5; (5)
- c) constructing the parabolic curve C shown in Figure 3b, with the vertex of the conic located 45 mm away from the directrix; (5)
- d) invert the necessary portion of the ellipse and the parabola and place these curves under the hyperbola as shown in Figure 3b; (4)
- e) Complete the drawing by including support blocks at the base of the structure. (1)

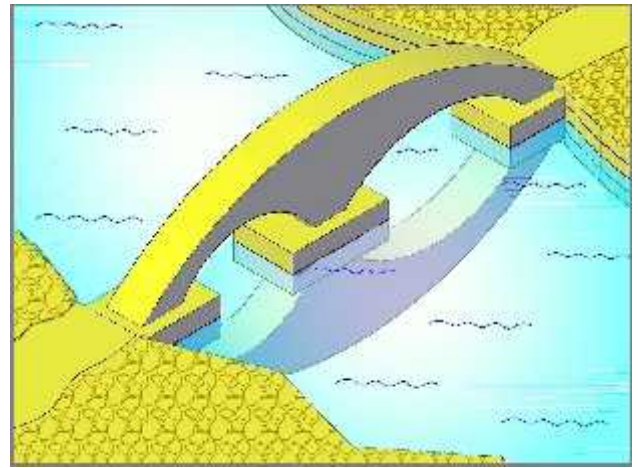


Figure 3a

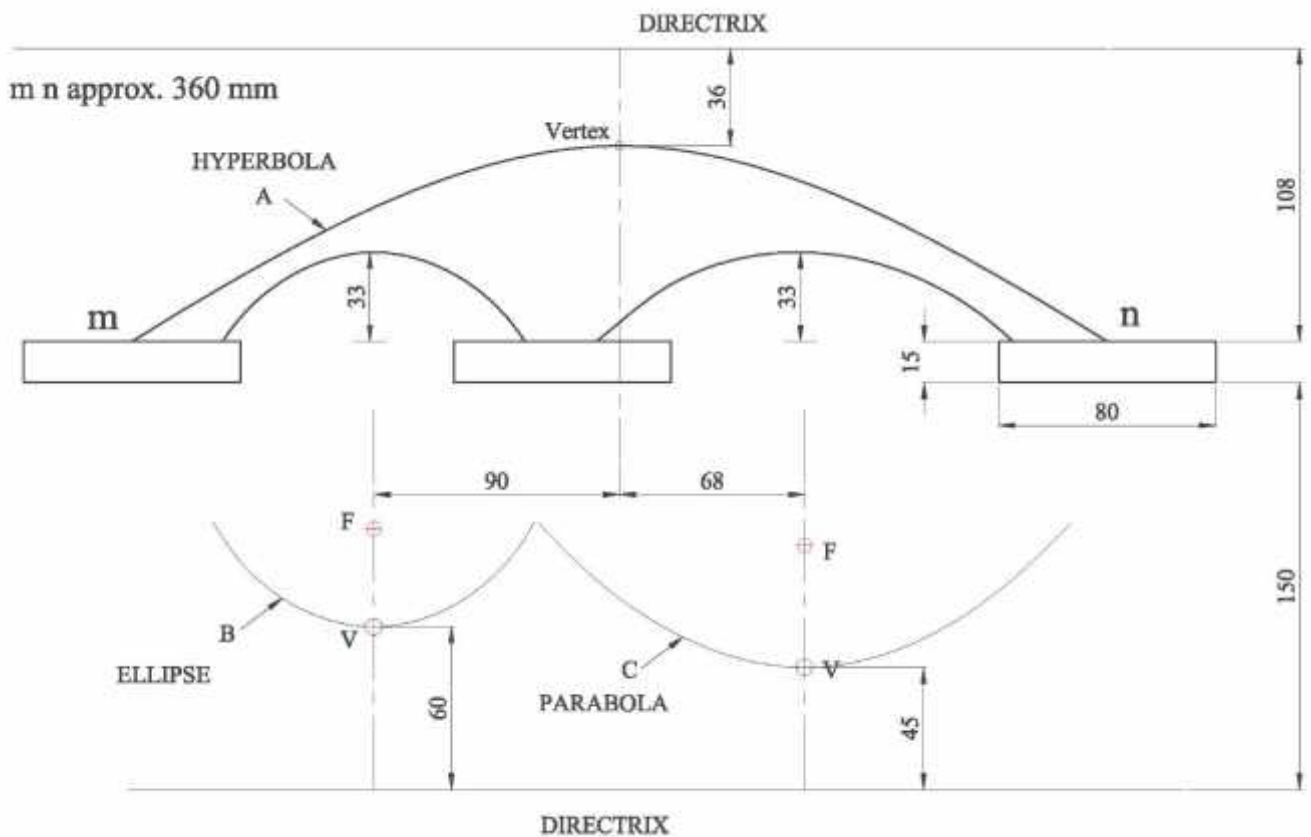


Figure 3b

4. A right hexagonal prism attached to a right cone is illustrated in Figure 4a. The inclined prism is parallel to the vertical plane and inclined at 30° to the horizontal plane.
- Refer to the given Figure 4b. Copy the two view and draw the auxiliary plan. (7)
 - Use light generating lines and obtain the curves of intersection on the:
 - front elevation; (4)
 - plan. (5)
 - Project an outside end elevation in the direction of the arrow A. (4)
- Show hidden detail on the plan view only.
(Total: 20 marks)

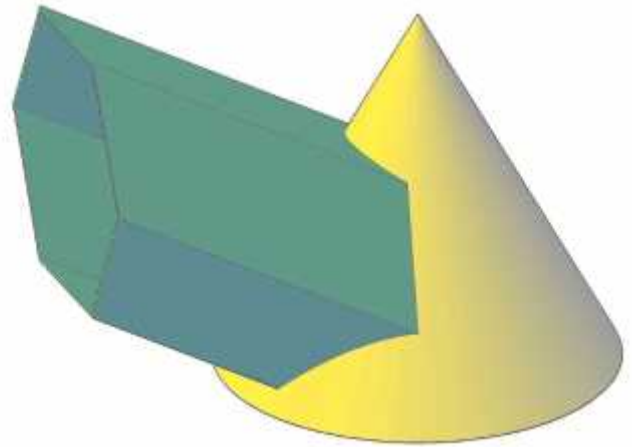


Figure 4a

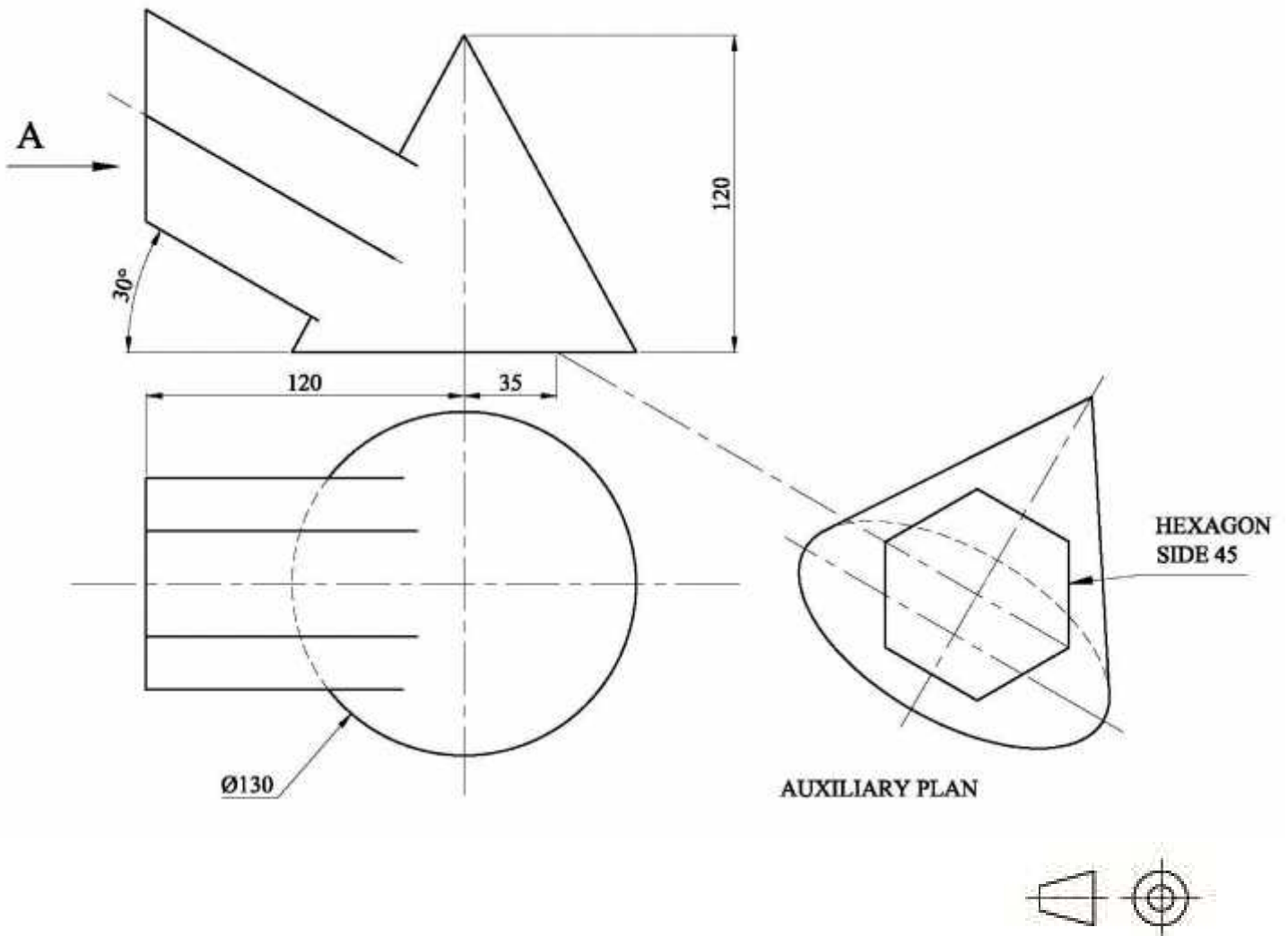


Figure 4b

5. The illustration, Figure 5a, shows a shop window display, specializing in various lampshades. Two identical shades are frustum of right cones and the other lampshades are spherical with a portion of the spheres removed.

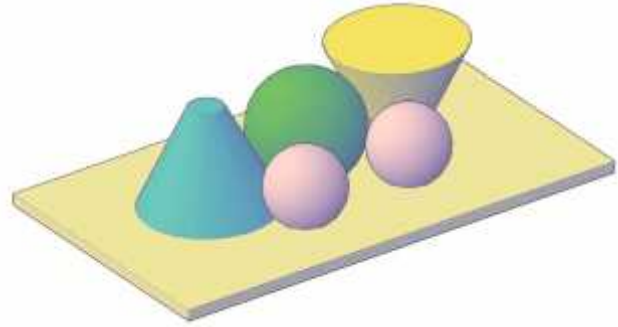


Figure 5a

a) Draw, full size, Figure 5b, showing the lampshades in mutual contact with each other. (9)

b) Include another two smaller spherical shades, as per detail 'A', in front of the cones and sphere, each touching the cone and the sphere. Complete the display shown in Figure 5a. Show points of contact and hidden detail. (11)

(Total: 20 marks)

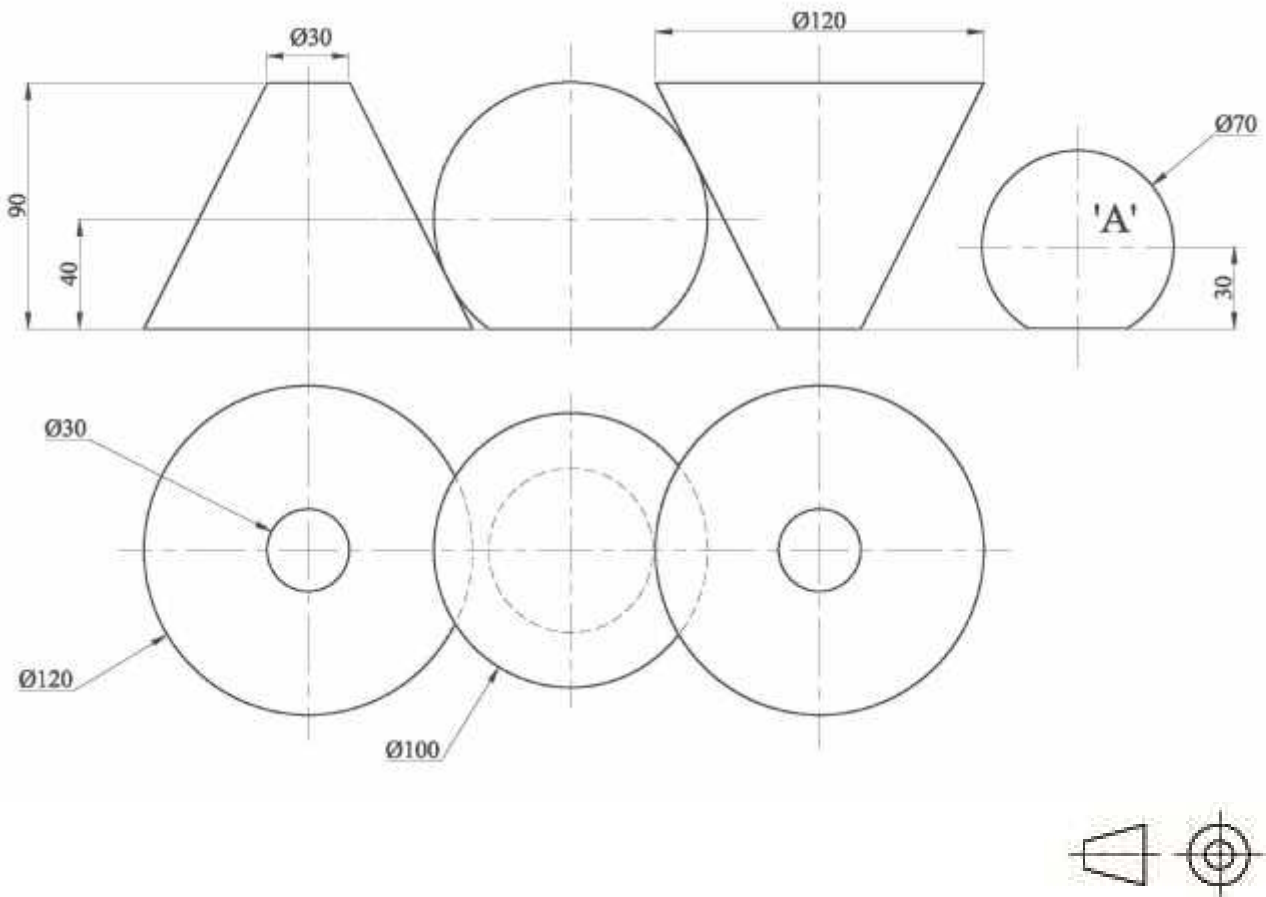


Figure 5b

6. A hole is machined through a hexagonal solid prism 160 mm high. The prism rests on the horizontal plane and an oblique plane having traces V.T. and H.T. passes through the prism, slicing off two sides of the base as illustrated in Figure 6a.

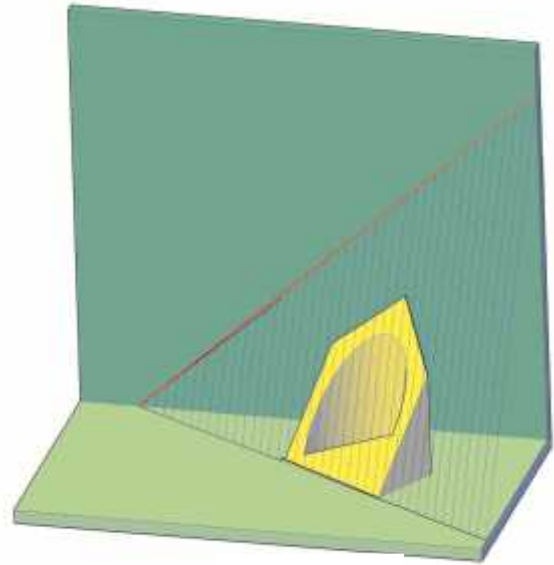


Figure 6a

- a) Draw full size, the traces and the plan of the irregular solid ABCDE as shown in Figure 6b. The sides AB, BC, CD and DE are the sides of a regular hexagon. (3)
- b) Construct an auxiliary elevation of the solid showing the oblique plane as an inclined plane passing through the solid. State the true inclination of the oblique plane to the H.P. (5)
- c) Project a front elevation of the pierced irregular shaped solid. (6)
- d) From the first auxiliary elevation, draw a second auxiliary view showing the true shape of the section produced by the oblique plane. (6)

(Total: 20 marks)

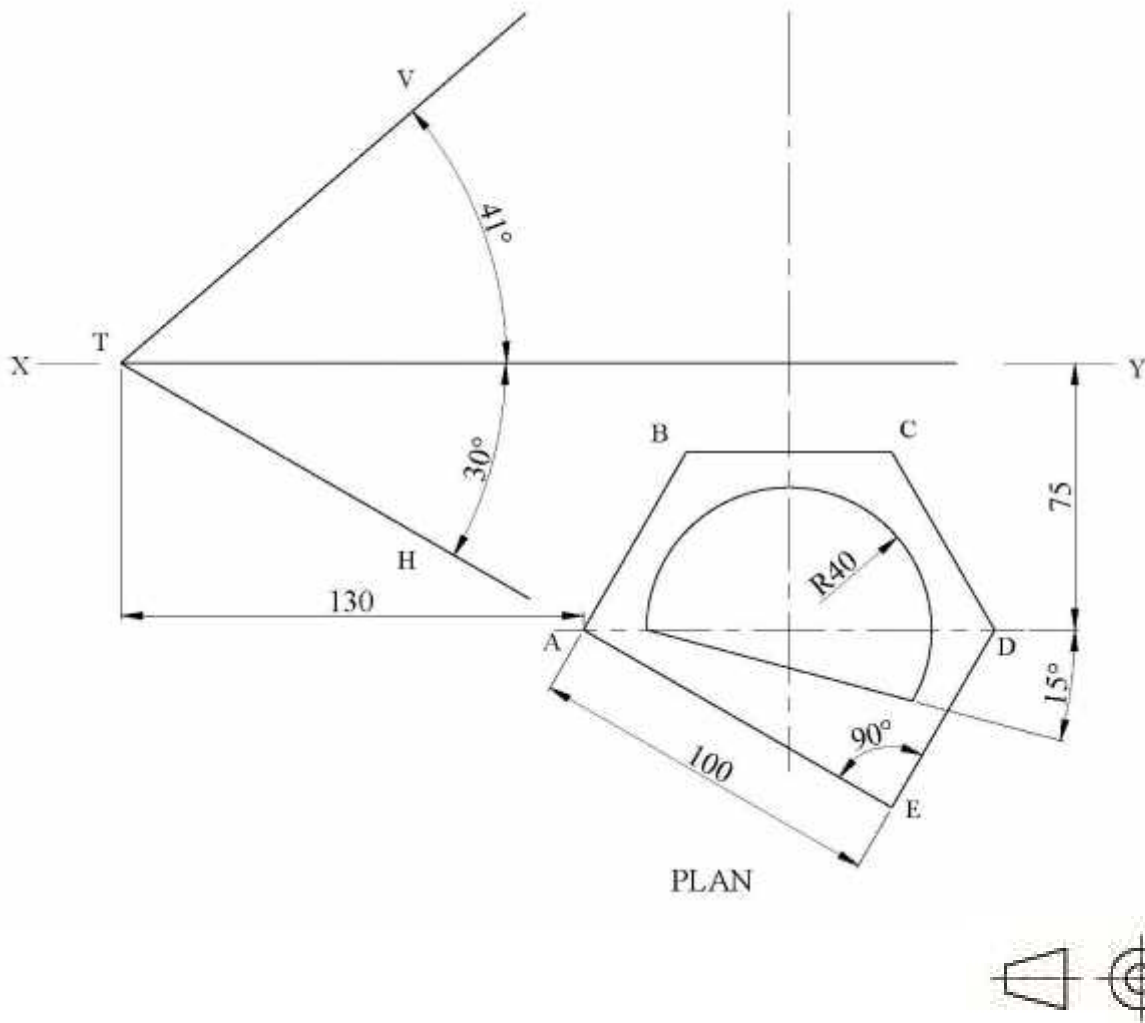


Figure 6b

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA
MATRICULATION EXAMINATION
ADVANCED LEVEL
SEPTEMBER 2017

| | |
|----------------------|--------------------------------|
| SUBJECT: | GRAPHICAL COMMUNICATION |
| PAPER NUMBER: | II |
| DATE: | 5 th September 2017 |
| TIME: | 9.00 a.m. to 12.05 p.m. |

Directions to Candidates

Write your index number where indicated at the top of all drawing sheets.

Attempt all questions.

Programmable calculators cannot be used.

Unless otherwise stated:

- a. drawings should conform to B.S. or equivalent (ISO) standards;
- b. all dimensions are in millimetres;
- c. all answers are to be accurately drawn with instruments;
- d. all construction lines must be left on each solution;
- e. 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 should be used where appropriate.

Mark allocations are shown in brackets.

Question 1 carries 34 marks. Questions 2, 3 and 4 carry 22 marks each.

1. A front elevation and a plan of a barbecue area are given in Figure 1. The barbecue is built with firebricks on a tiled platform partially surrounded by a low brick fence and accessed by means of one wide step. Four lanterns are fitted at the corners of the fence surrounding the tiled area. Decorative plants enhance the landscape design.

The given views constitute an integral part of the design process, but fail to convey a feeling of the 3D proportions of the barbecue area.

You are to meet this requirement by drawing a one-point estimated perspective view. The viewing direction required is indicated by the arrow in the plan view.

- a. Using **THREE** preliminary sketches, explore alternative positions of the horizon line and identify the one which, in your opinion, best presents the spaciousness of the barbecue area. (3)
- b. Based on the choice made in part (a), produce the required illustration on a single side of an A2 size paper making the best use of the space available. (25)
- c. Enhance your answer graphically using colours, tone and texture. (6)

Notes:

- The width of the square floor tiles is 40 mm.
- Each unit in the vertical scale represents 40 mm.
- You are expected to apply colour/tone/texture to the right-hand half of your drawing.

(Total: 34 marks)

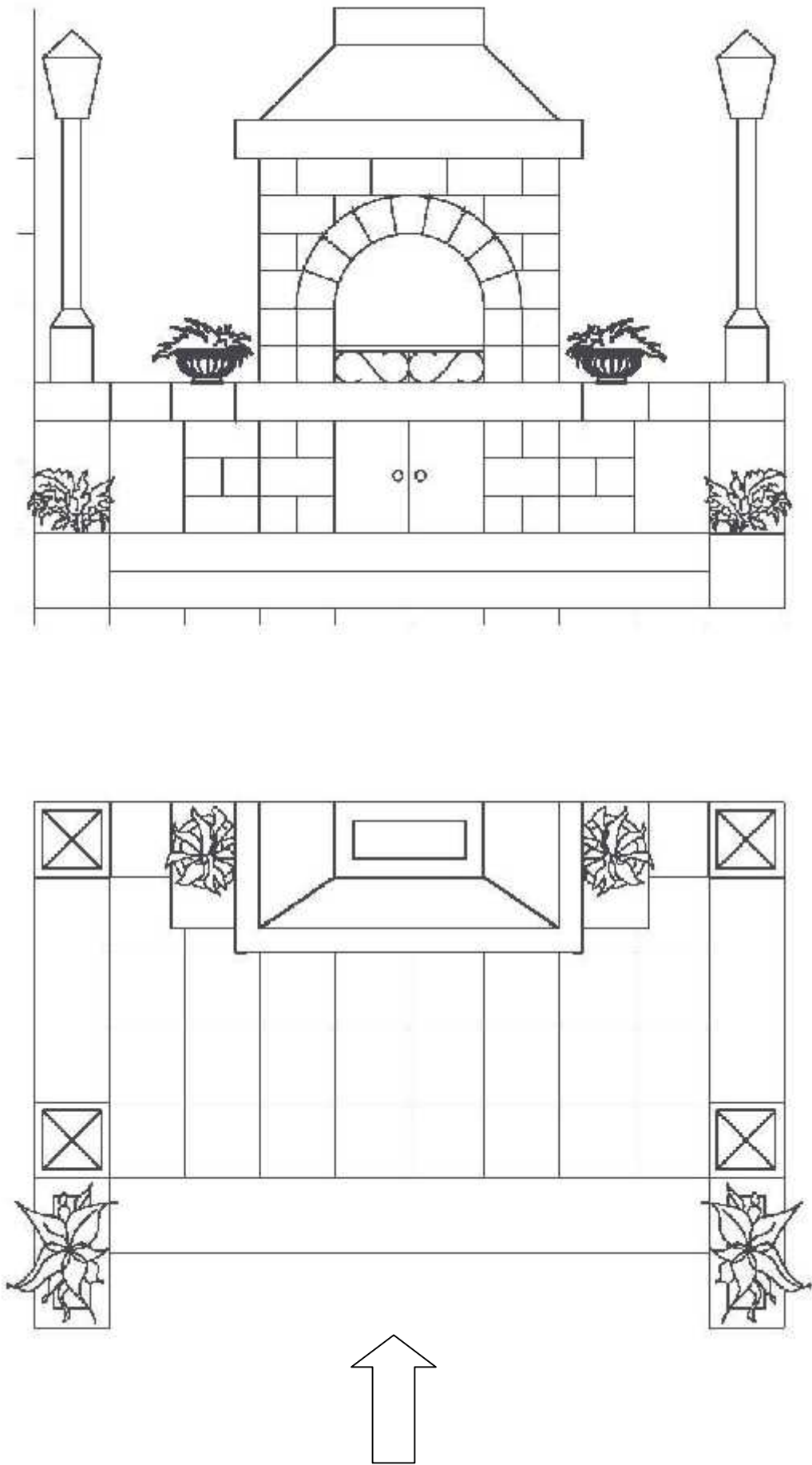


Figure 1

2. A recent survey about alcohol use among young persons aged between 18 and 22 yielded the following data:
 - a) Alcohol consumption
 - 6 out of 10 are moderate drinkers;
 - 4 out of 10 are binge drinkers (consume an excessive amount of alcohol during the weekend);
 - 1 out of 10 is an alcoholic (drinks alcohol heavily everyday).
 - b) Consequences of alcohol abuse
 - violence and crime;
 - health problems;
 - injuries and deaths.

You are required to design an infographic chart titled **ALCOHOL**. Your design should be composed of text, pictograms, charts and other symbols you feel necessary to illustrate graphically the given data. A typical example is shown in Figure 2.

Marks will be awarded for:

- balanced composition of the chart; (4)
- simplicity of graphic symbols; (4)
- appropriate typefaces used for the title and for the other text; (4)
- proper use of colours; (4)
- general visual impact. (6)

(Total: 22 marks)

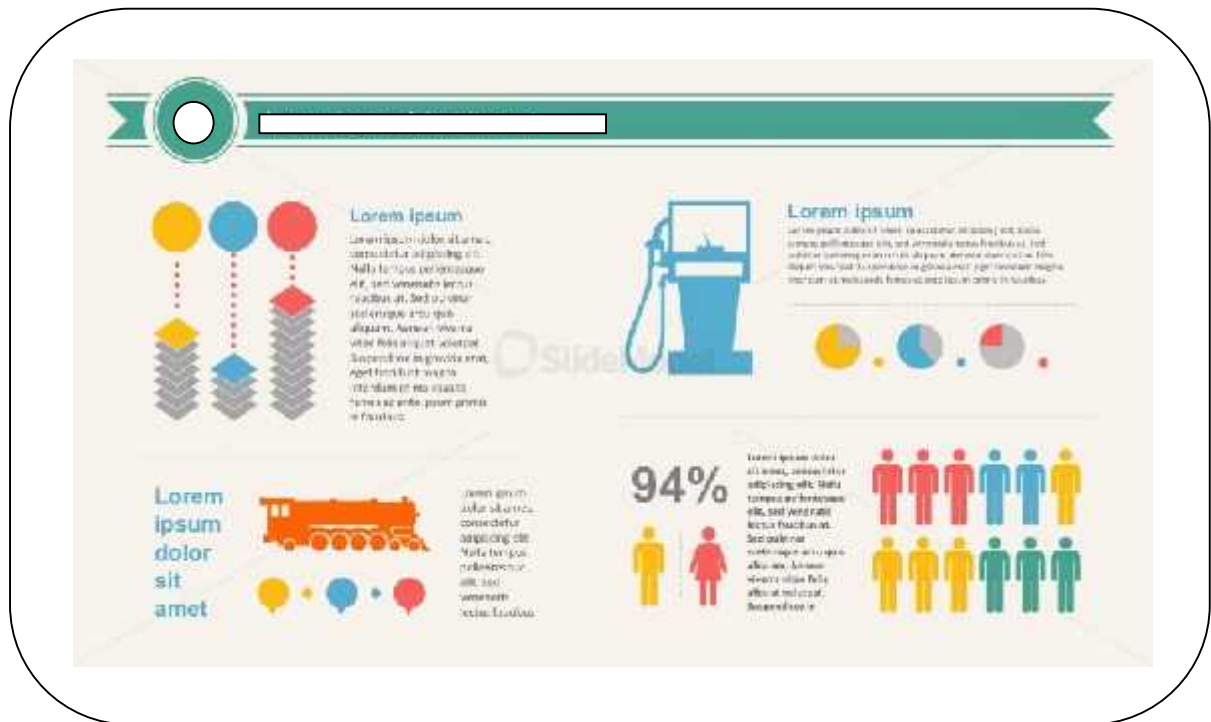


Figure 2

3. The surface developments of five components that, when bent, assembled and joined together, form a copper jug are shown in Figure 3.
- Component A (conical spout) is bent and joined along seam line A₁ – A₂.
 - Component B (cut cone) is bent and joined along seam line B₁ – B₂.
 - Component C (cut cone) is bent and joined along seam line C₁ – C₂.
 - Component D (to remain flat) is the circular base of the jug.
 - Component E (handle) is bent in the form of an S-scroll and joined to the assembled jug covering seam line of component A and the lower part of seam line of component B.

You are requested to:

- Sketch pictorial drawings of the bent components in the correct sequence of assembly; (5)
- draw an isometric freehand sketch of the assembled jug approximately 250 mm high; (12)
- colour the drawing to illustrate that the jug is made of polished copper. (5)

Note: The diameter of the circular base (component D) is approximately 90 mm.

(Total: 22 marks)

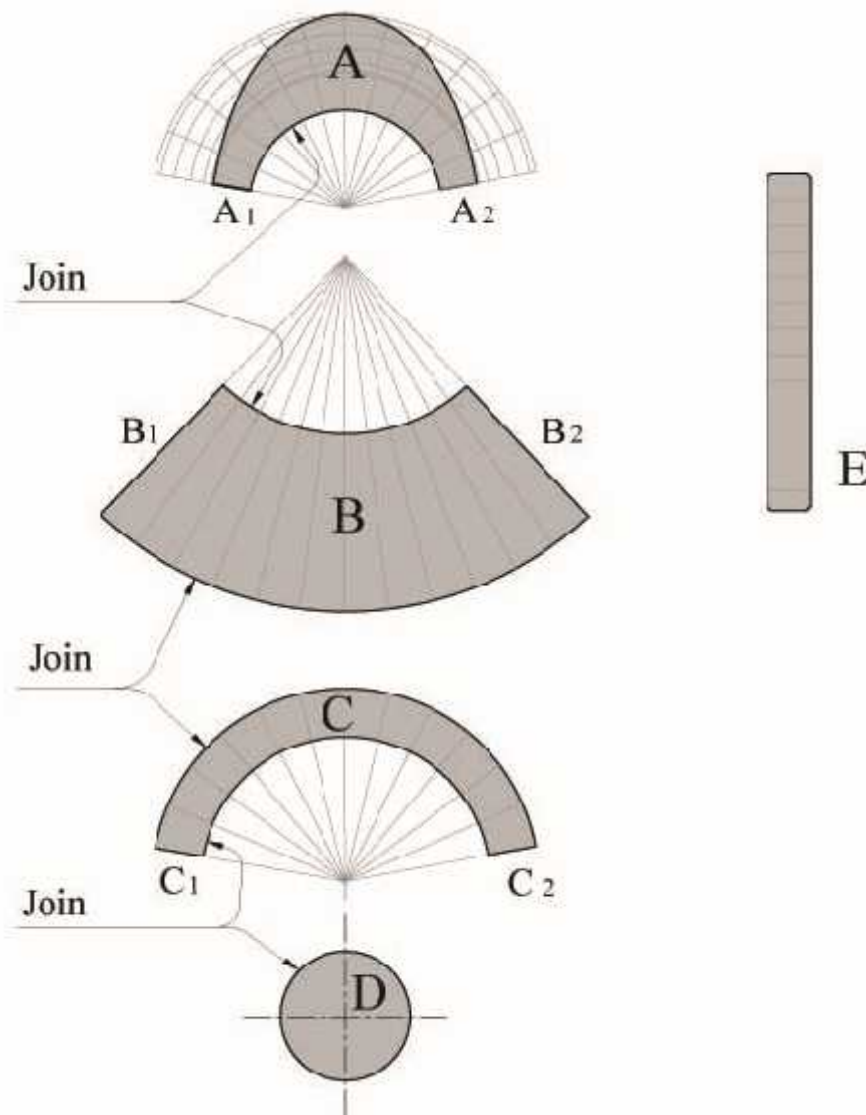


Figure 3

4. Jolly Baby is the name of a new baby soap product. The company is using "The finest baby soap" tagline to promote its product. An illustration of the plastic container in which the soap is to be bottled is shown in Figure 4a below.

You are requested to design the label of the bottle. Your label design must be eye-catching, give the necessary information and persuade the customer to put it in the shopping basket. Special consideration is to be given to the following aspects:

- typography;
- graphic symbol/s;
- colour scheme;
- layout.

Your presentation must follow the steps given below and organised as indicated in Figure 4b.

- a) Written analysis
Identify, using keywords and short phrases, the main parameters of the label design. (2)
- b) Graphical analysis
Based on your response to part (a), produce a series of sketches that illustrate your developing ideas. (4)
- c) Graphical synthesis
Clearly identify the elements in your sketches which you intend to use in the final drawing. (2)

- d) Final realization
Produce your final solution in the label frame. The shape and dimensions of the label are indicated in Figure 4b. (14)

(Total: 22 marks)



Figure 4a

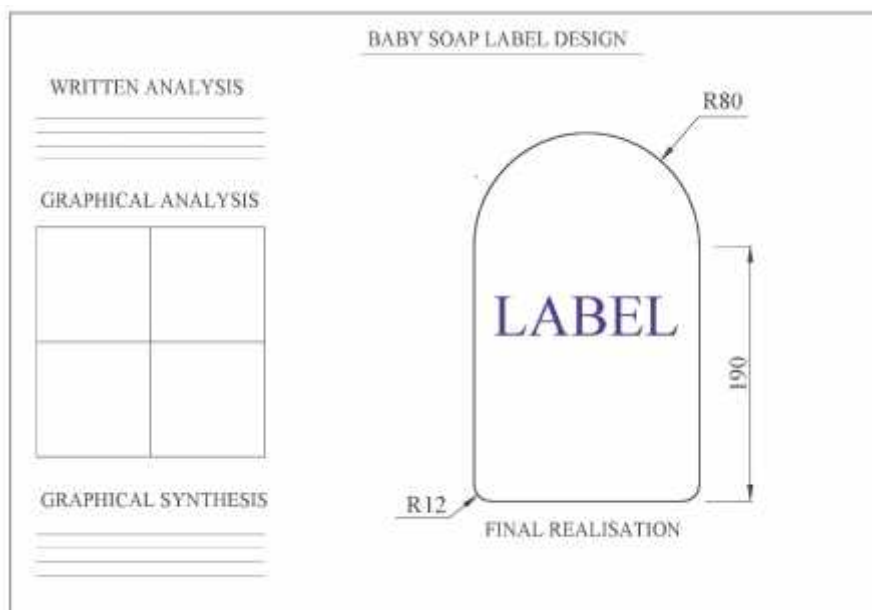


Figure 4b