



SUBJECT:	Engineering Drawing and Graphical Communication
DATE:	6 th September 2018
TIME:	4:00 p.m. to 7:05 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

A sketch of a railing is shown in Figure 1a. The railing consists of repetitive motif panels welded together. The pattern inside each panel is formed by two geometrical curves A and B. The design has a line of symmetry and the right-hand side is a mirror image of the left-hand side.

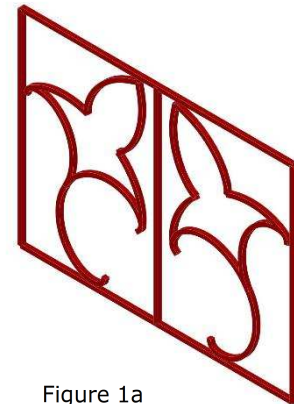


Figure 1a

Draw, full size,

- a) Curve A, which is the locus traced by the point P, situated on the outer circumference of a circle. The outer circle is fixed to an inner 50mm diameter circle and the inner circle is constrained to roll on its circumference, without slipping, round a fixed directing curve. Construct the locus of the point P after the inner circle has rolled for one revolution. Name the curve generated. (9)
- b) Curve B, is the locus of a point Q, on the circumference of a 50 mm diameter circle tangential to the line Q-Q. Trace the locus of the point Q as the circle rolls, three quarters of a revolution, without slipping, on the inclined line. Name the curve traced. (4)

(Total: 13 marks)

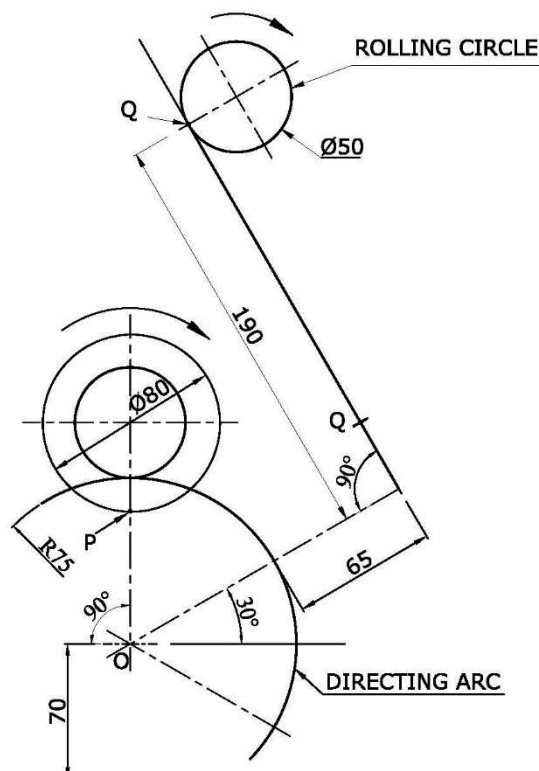
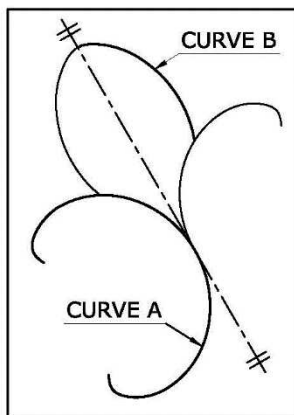


Figure 1b

Question 2

An illustration of conical hopper fitting on to a horizontal cylindrical pipe is shown in Figure 2a.

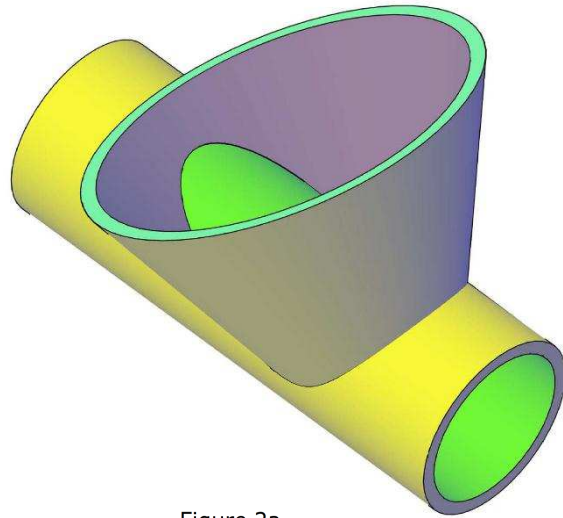


Figure 2a

a) Draw, full size, the incomplete elevation of the cone shown in Figure 2b. (2)

b) Copy the end elevation of the cone and the cylindrical pipe. (3)

c) Determine the points which shall be on the joint line for the cone to complete the front elevation and draw a smooth curve to show the interpenetrating curve between the inverted right cone and the cylinder. (4)

d) Draw the development represented by the arc PQR of the cylinder. (4)

(Total: 13 marks)

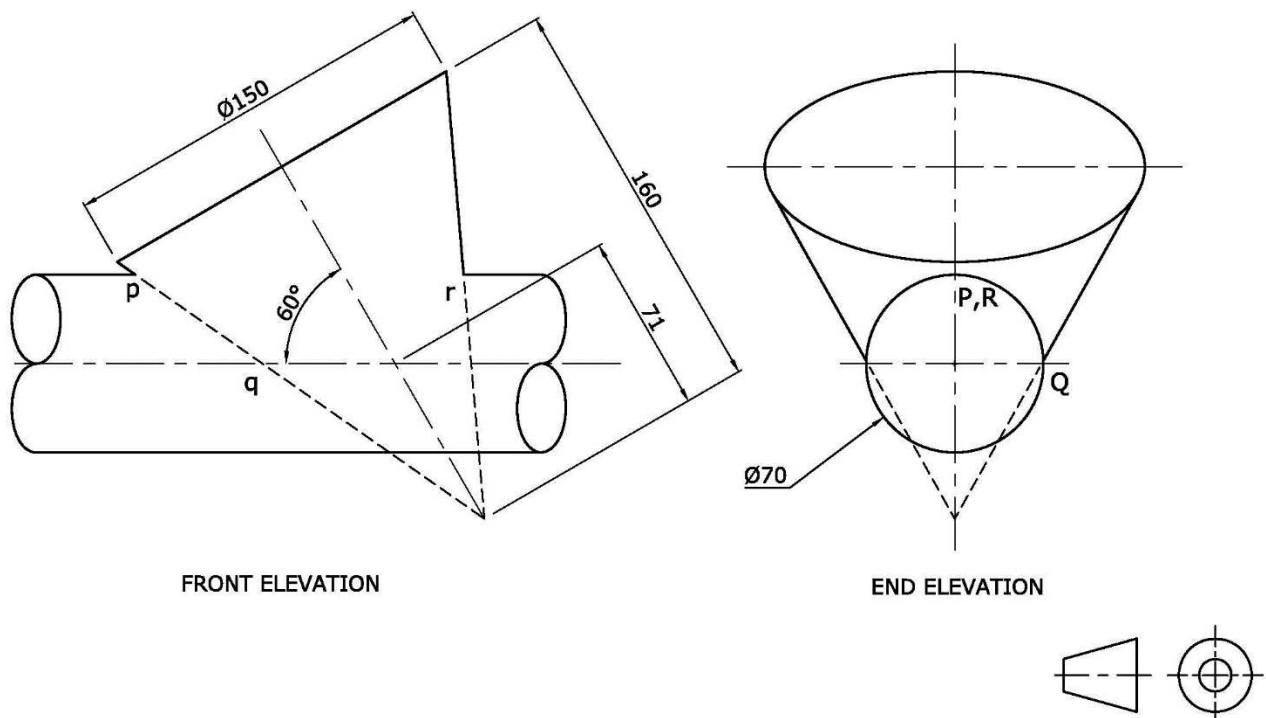


Figure 2b

Question 3

A beam is hinged to a fixed support at the left-hand end. The board is supported at a point 2 m from the right-hand end, resting in a horizontal position.

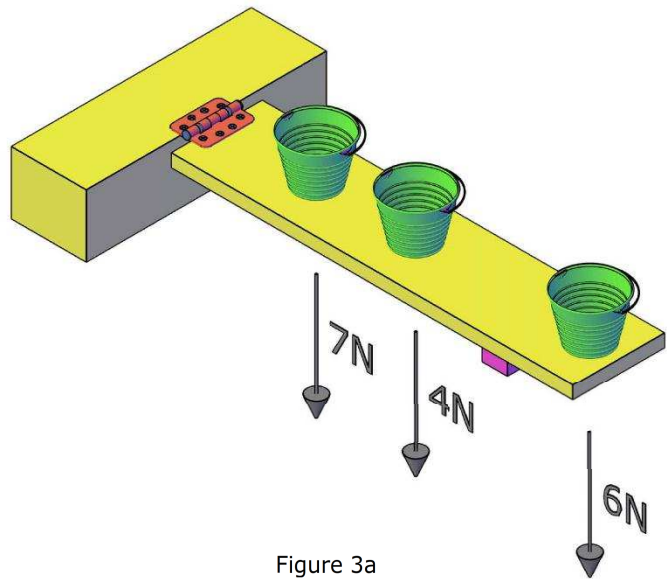


Figure 3a

a) Using a scale of 10 mm representing 1 metre, reproduce the given space diagram shown in Figure 3b and complete with Bow's notation. (2)

b) Draw the force diagram for the three parallel forces, use a scale of 10 mm representing 1 N. Choose a suitable location for point O outside the force diagram and complete the polar diagram. (3)

c) Draw a funicular polygon and determine graphically the values of the reaction at the hinge and the reaction on the right. State the values of:
 i. the reaction at the hinge;
 ii. the reaction on the right. (5)

d) Draw a shear force diagram. (2)

e) Determine the position where the bending moment is zero. State the distance measured from the hinged point. (1)

(Total: 13 marks)

SPACE DIAGRAM

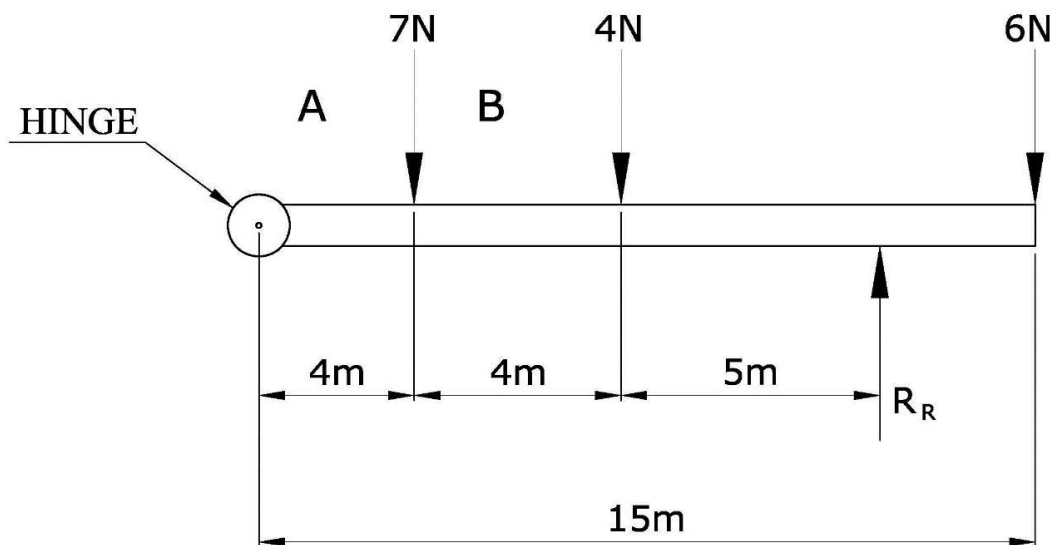


Figure 3b

Question 4

A transition piece suitable for connecting two irregular shaped ducts is illustrated in Figure 4a.

- a) Copy, full size, the two views of the transition piece shown in Figure 4b. Details of the irregular shaped top and base of the transition are shown in Figure 4c and Figure 4d. (4)
- b) Using suitable clear construction:
 - i. determine the true lengths required; (3)
 - ii. draw the true shape of the sheet pattern before bending. (6)

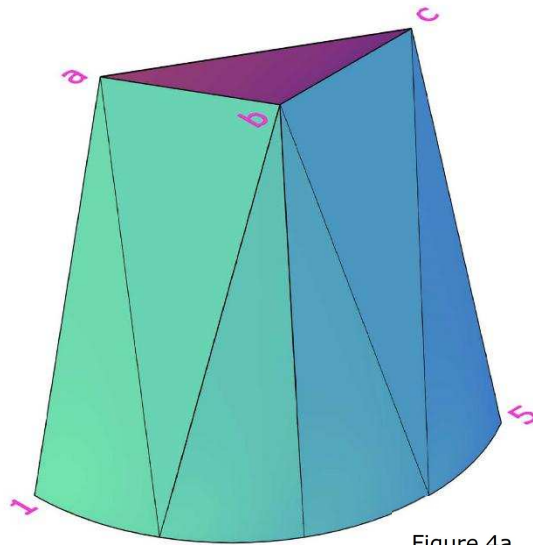


Figure 4a

All bend lines must be indicated and clear notation must appear on your drawing. Show the joint line on the line a-1.

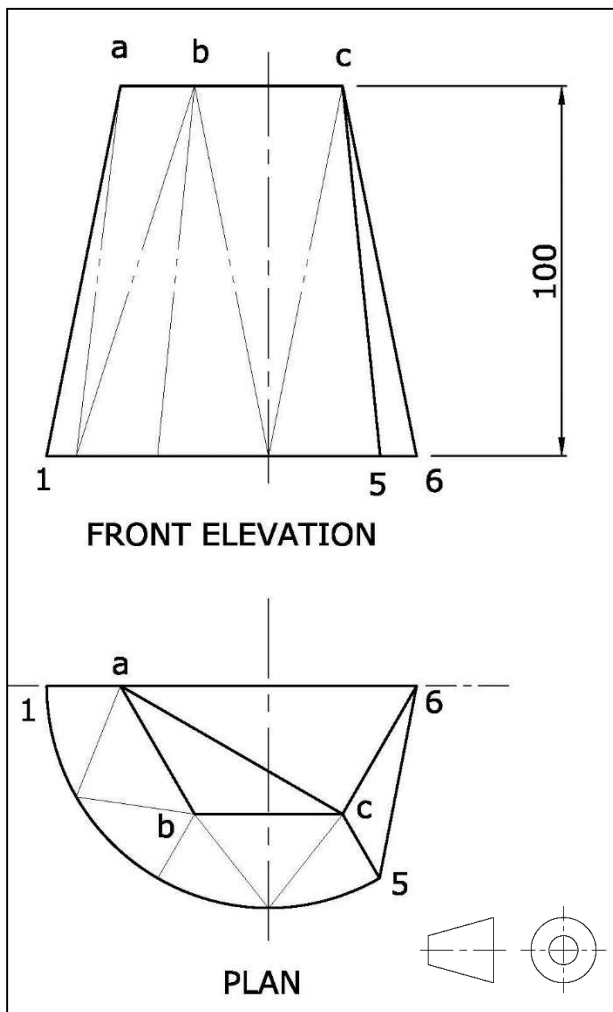


Figure 4b

(Total: 13 marks)

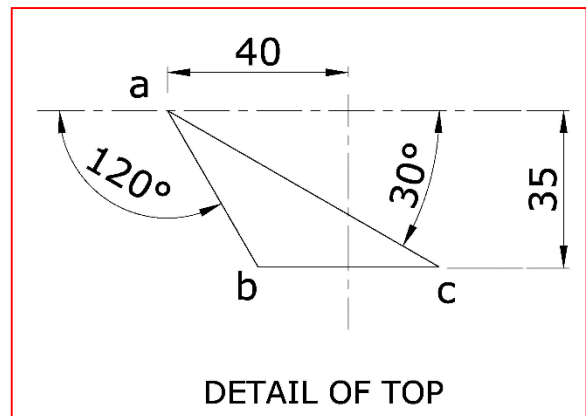


Figure 4c

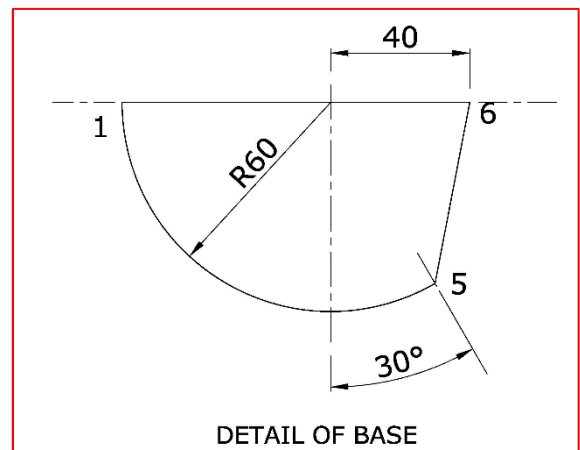


Figure 4d

Question 5

Two links are shown pivoted to a rigid board. A third link connects the pivoted two links together. Each link is joined at its ends as shown in Figure 5a. The three links are equal in length.

a) Draw, full size, Figure 5b representing the three links by a line drawing. (2)

b) Plot the complete locus of the point P as the links swing to their maximum travel in both directions. Point P is the mid-point of the link AB. Show all construction lines showing how the path of P is obtained. (10)

c) Name locus of the mid-point on this particular mechanism. (1)

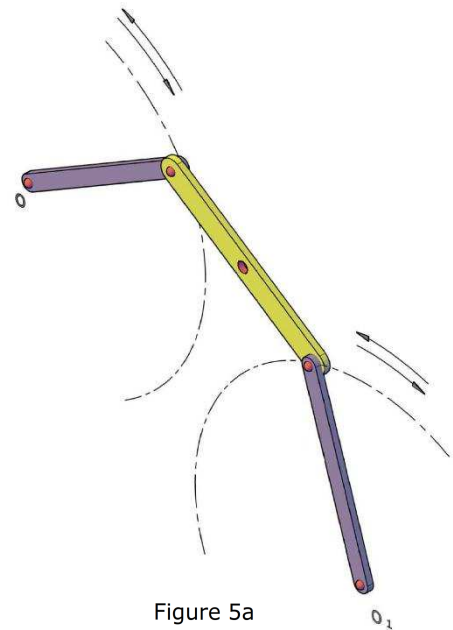


Figure 5a

(Total: 13 marks)

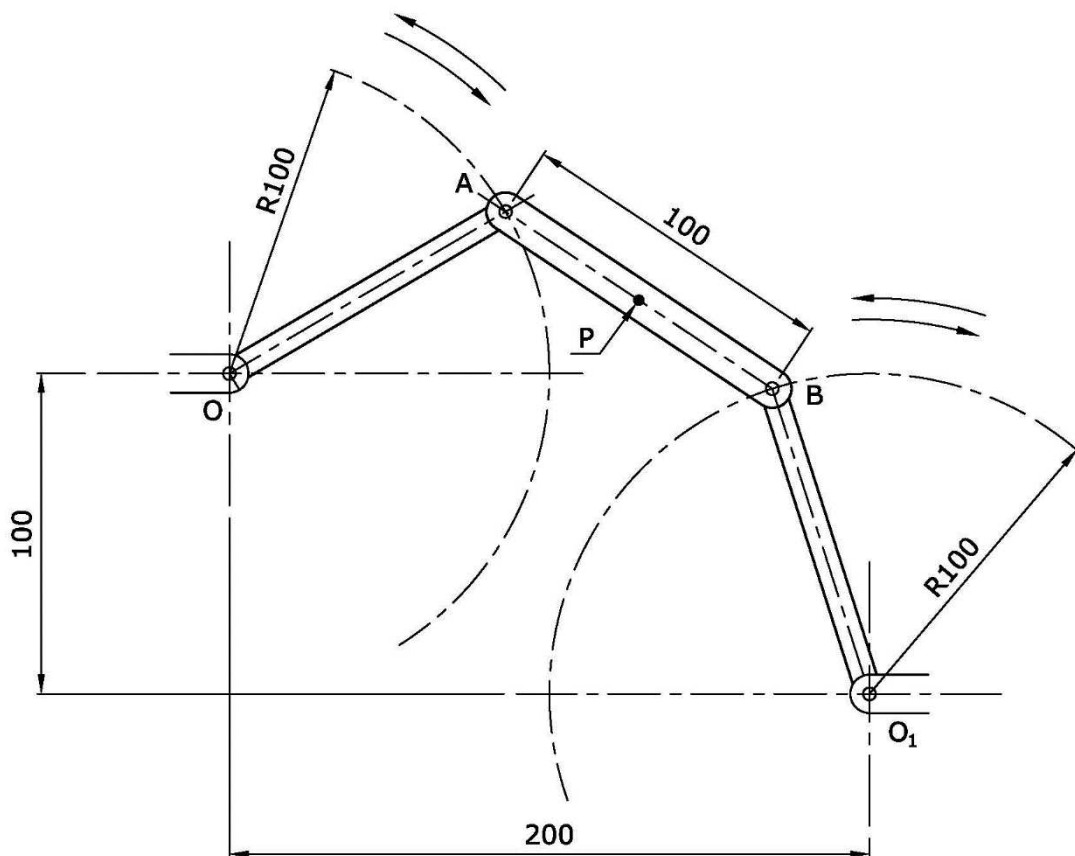


Figure 5b

SECTION B

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

Question 6

An exploded illustration of a Shaft Coupling is represented in Figure 6a. The assembled coupling is suitable for a 60 mm diameter shaft. Each half coupling is fitted on the end of a shaft and retained by means of a key. Dimensioned details of each item are shown in Figure 6b and Figure 6c, on the attached A3 sheet.

The left hand half of the coupling is assembled as follows:

- the key (Item 3) is fitted into the keyslot recess of the 60 mm diameter shaft end (Item 2);
- the left hand coupling (Item 1) is inserted in the keyslot recess end of the shaft and located by means of the key.

The right hand half of the coupling is assembled in a similar manner.

- the key (Item 6) is fitted into the keyslot recess of the 60 mm diameter shaft end (Item 5);
- the right hand coupling (Item 4) is inserted in the keyslot recess end of the shaft and located by means of the key.

The half couplings are then bolted together Face A to Face B, by means of three retaining 20 mm diameter bolts, washers and nuts (not shown), which transmit the load from one half coupling to the other.

a) Draw, full size, a sectional front elevation view of the assembled coupling:

- on the upper half of the front view, show a quarter of the coupling removed along the section plane A-A; (18)
- on the lower half of the front view show only a portion (approximately 60 mm below the centre line) of the external view of the lower half. (2)

b) Represent the:

- hexagonal bolt, washer and nut assembled in position; (3)
- key feature as a local section on the shaft end, at the left hand coupling. (1)

Include suitable fillet radii.

(Total: 24 marks)

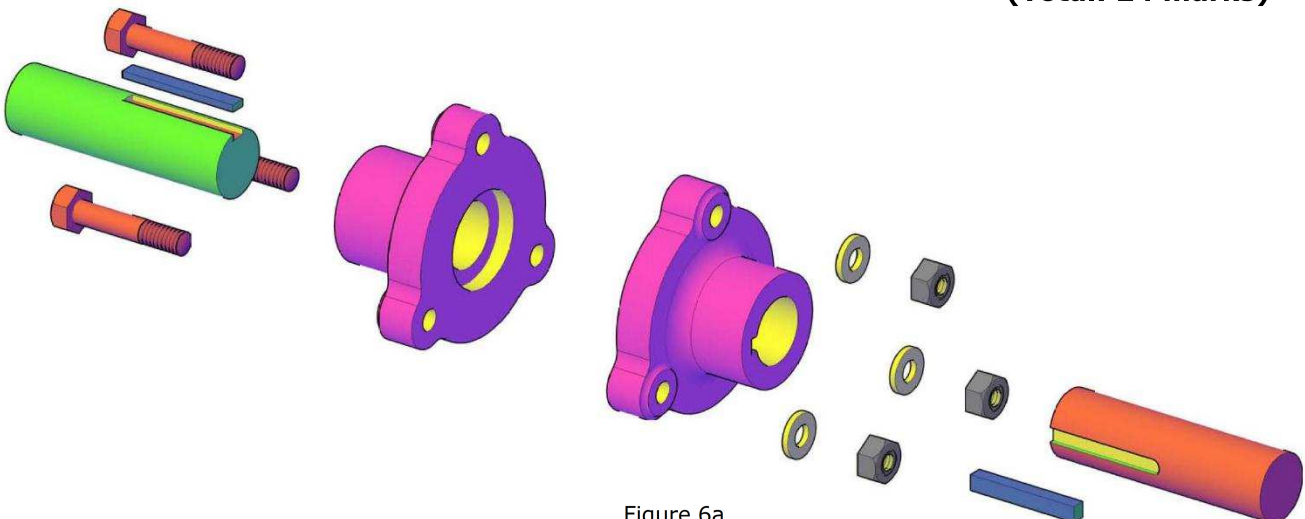


Figure 6a

Question 7

Locking features are used on machinery subjected to continuous vibration because bolts and nuts tend to slacken off gradually. An illustration of a locking device is shown in Figure 7a.

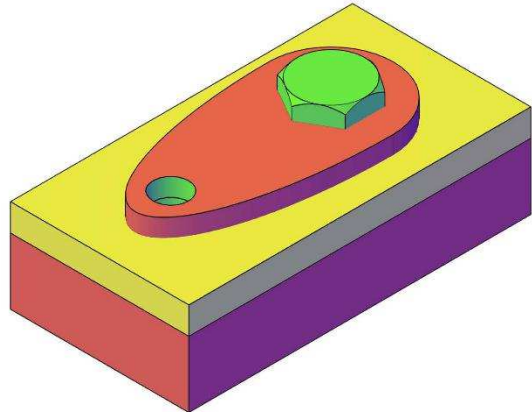


Figure 7a

a) Copy, full size, the assembled locking device shown in Figure 7b. (7)

b) Draw an auxiliary plan of the assembled locking device in the direction of the arrow A. (17)

(Total: 24 marks)

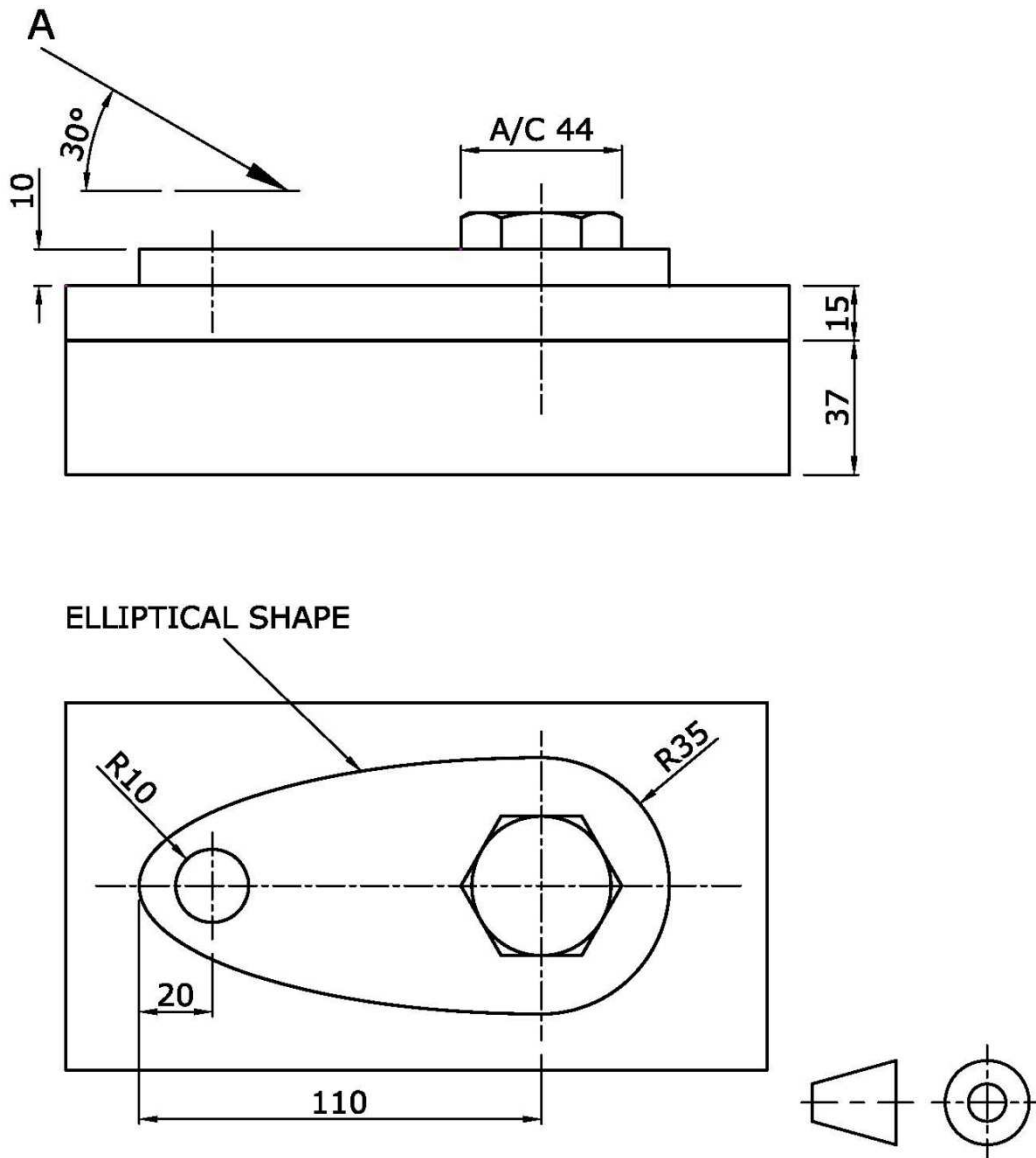


Figure 7b

SECTION C

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

Question 8

A design for a small house having a space of 8 x 5 metres is required. The design of the open plan one storey detached house is to include a living/dining room, a small kitchen, one bedroom and a bathroom. The design should attract prospective buyers, be functional and comfortable. A window for external light is recommended.

- a) Based on the design brief given, produce **FOUR** sketches to illustrate your proposal layout. Each sketch is to show an overhead view of the complete layout, indicating all rooms, doors and windows. Present the four sketches in four rectangles 120 mm by 120 mm. (12)
- b) Using a scale of 1:50, construct a planometric drawing of your final solution. A portion of the dividing walls may be partially removed so as to show the interior of the respective rooms. (10)
- c) Add rendering and include a few representative furniture/units. (2)

Attention is required for the presentation of the solution. Figure 8 shows an example for guidance.

(Total: 24 marks)

<p>Free hand sketches:</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="border: 1px solid black; width: 45%; height: 80px; margin: 5px;"></div> <div style="border: 1px solid black; width: 45%; height: 80px; margin: 5px;"></div> <div style="border: 1px solid black; width: 45%; height: 80px; margin: 5px;"></div> <div style="border: 1px solid black; width: 45%; height: 80px; margin: 5px;"></div> </div>	<p>Final drawing (planometric drawing):</p> <div style="border: 1px solid black; width: 90%; height: 200px; margin: 5px;"></div>									
UNIVERSITY OF MALTA	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">QUESTION No.</td> <td style="width: 33%;">SESSION:</td> <td style="width: 33%;">SCALE:</td> </tr> <tr> <td></td> <td>DATE:</td> <td></td> </tr> <tr> <td></td> <td>PAPER No:</td> <td>SHEET OF</td> </tr> </table>	QUESTION No.	SESSION:	SCALE:		DATE:			PAPER No:	SHEET OF
QUESTION No.	SESSION:	SCALE:								
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Figure 8

Question 9

An isometric drawing of a small office is shown in Figure 9a. The front view, end view and sectional plan are shown in Figure 9c. The office includes a corner L shaped wooden desk with compartments on each end, a soft carpet, four wooden shelves attached to the wall and a window allowing ventilation and light.

Use the dimensions given in the orthographic projection to construct an estimated two point perspective of the office. The viewing direction required is indicated by the arrows in the plan. Use the suggested layout of the two point perspective shown in Figure 9b. (19)

Render in colour your drawing to enhance its presentation. (5)

(Total: 24 marks)

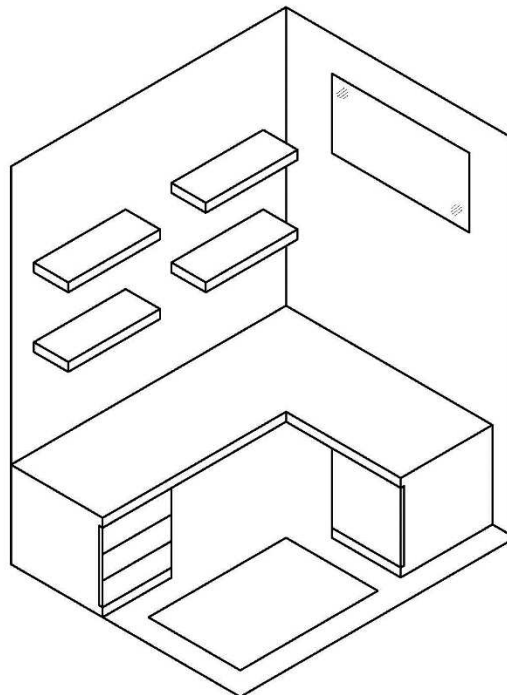


Figure 9a

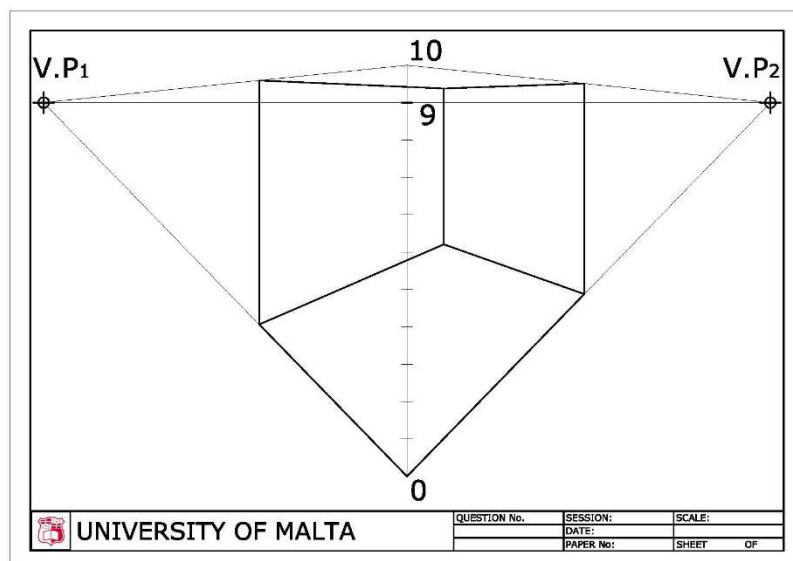


Figure 9b

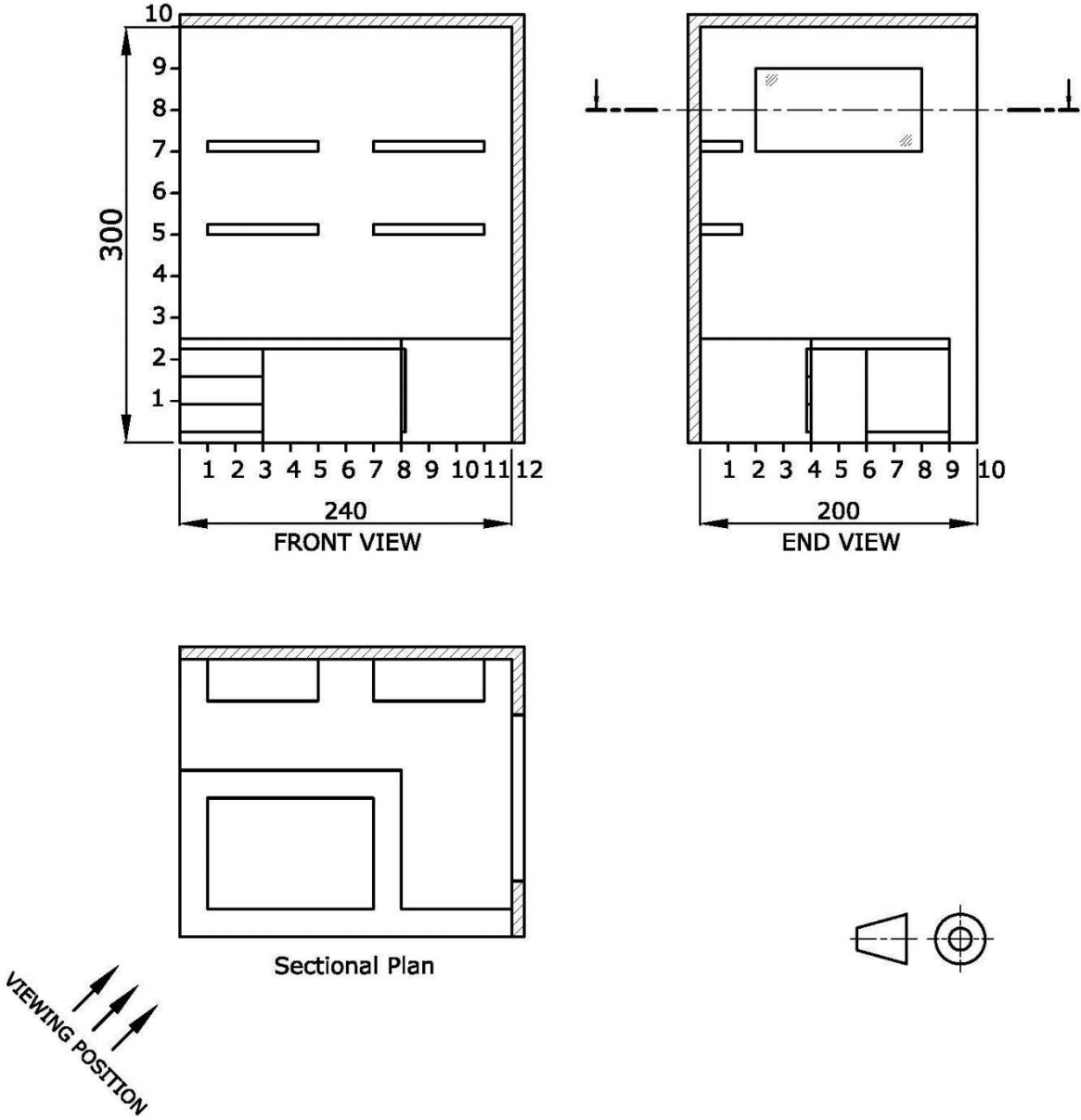
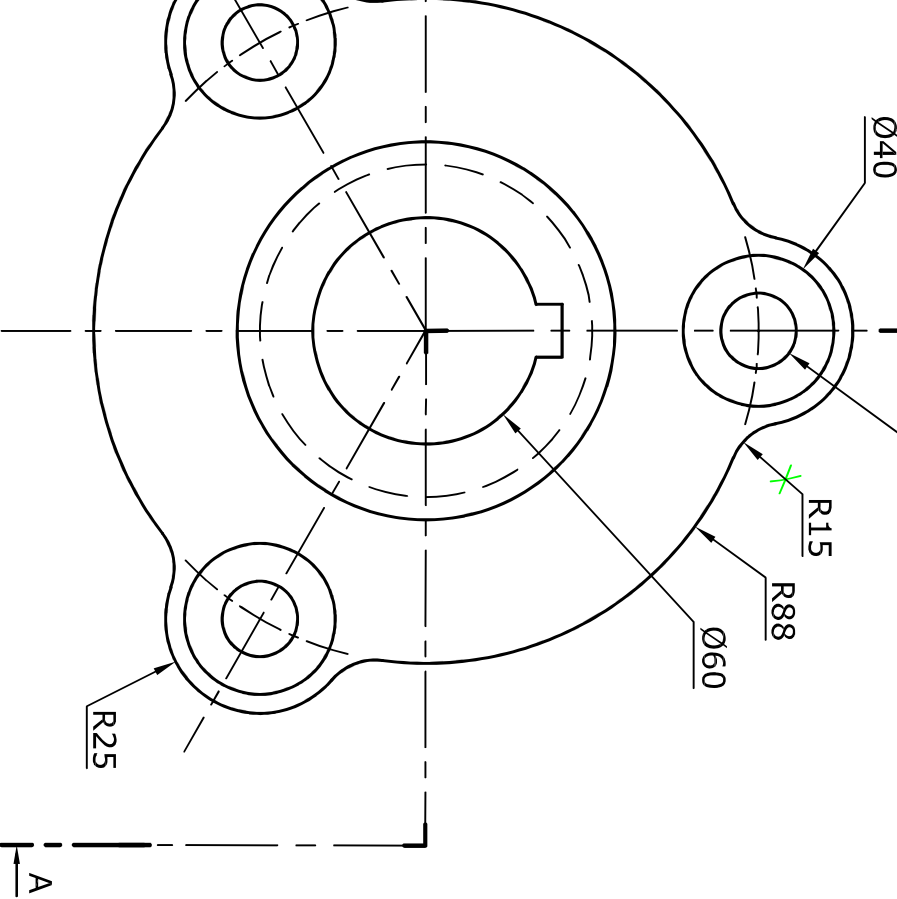
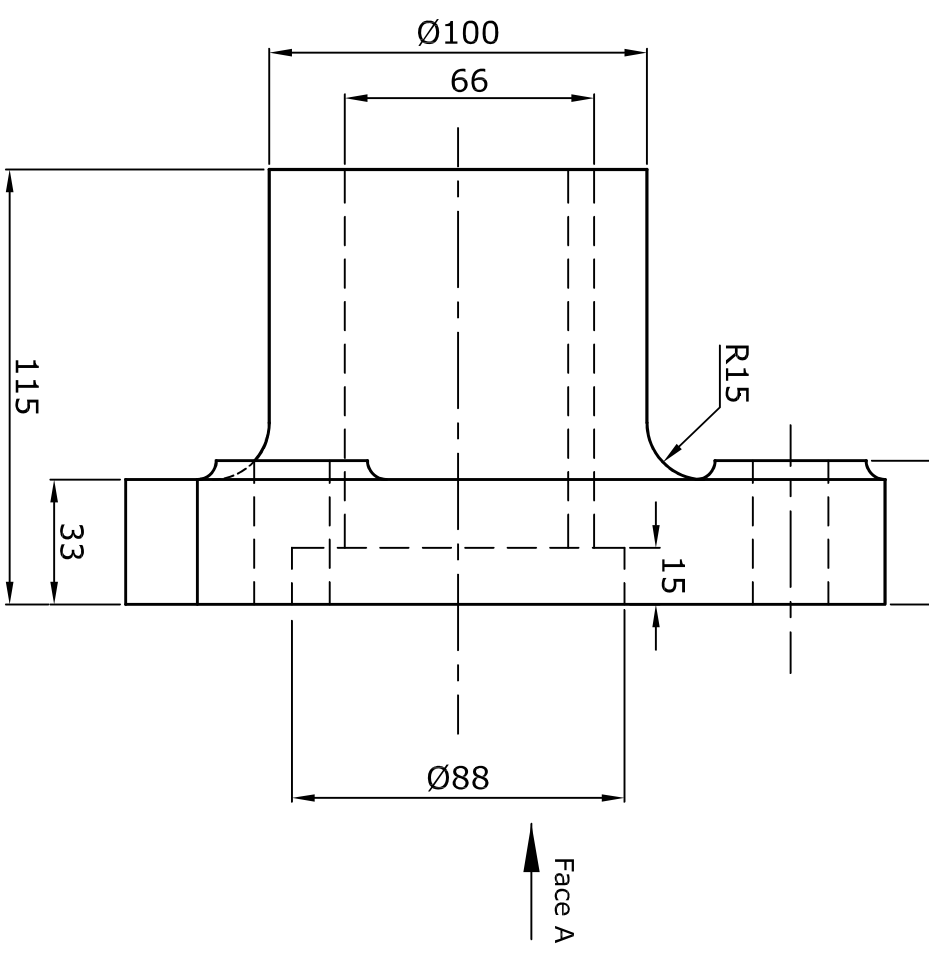


Figure 9c

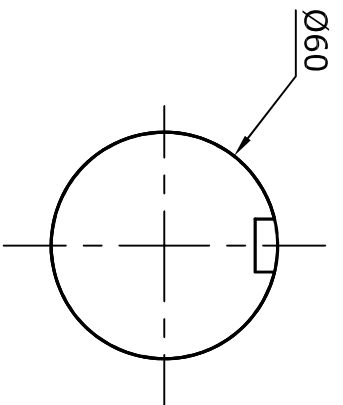
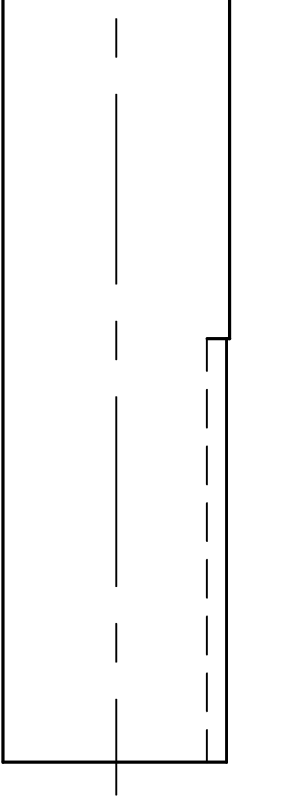


END VIEW

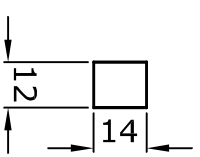


FRONT VIEW

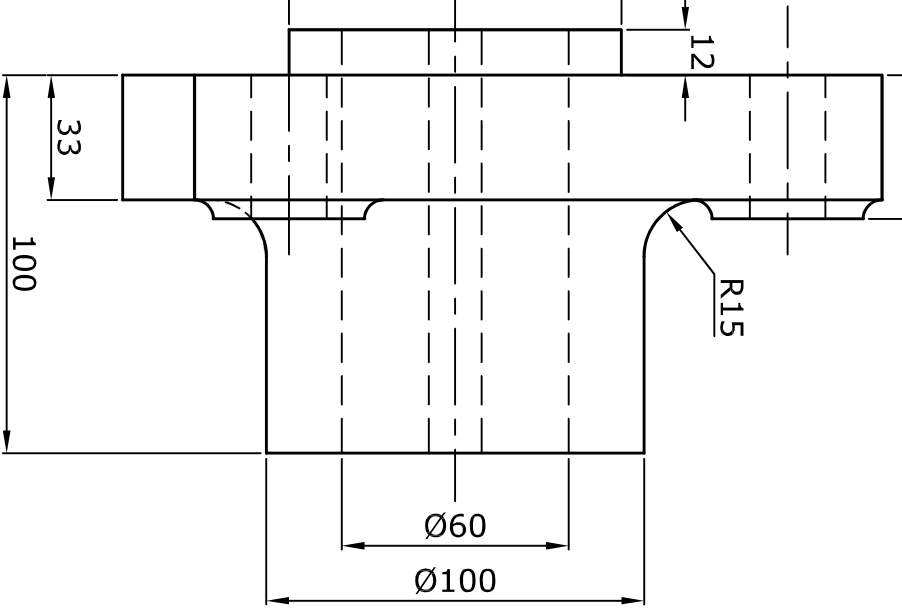
(ITEM 1) LEFT HAND HALF OF COUPLING



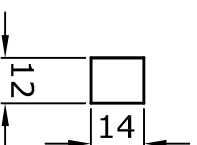
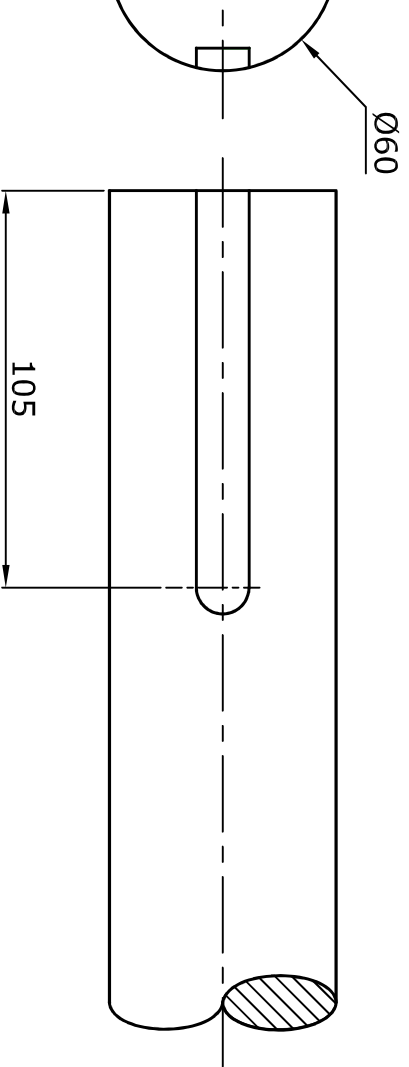
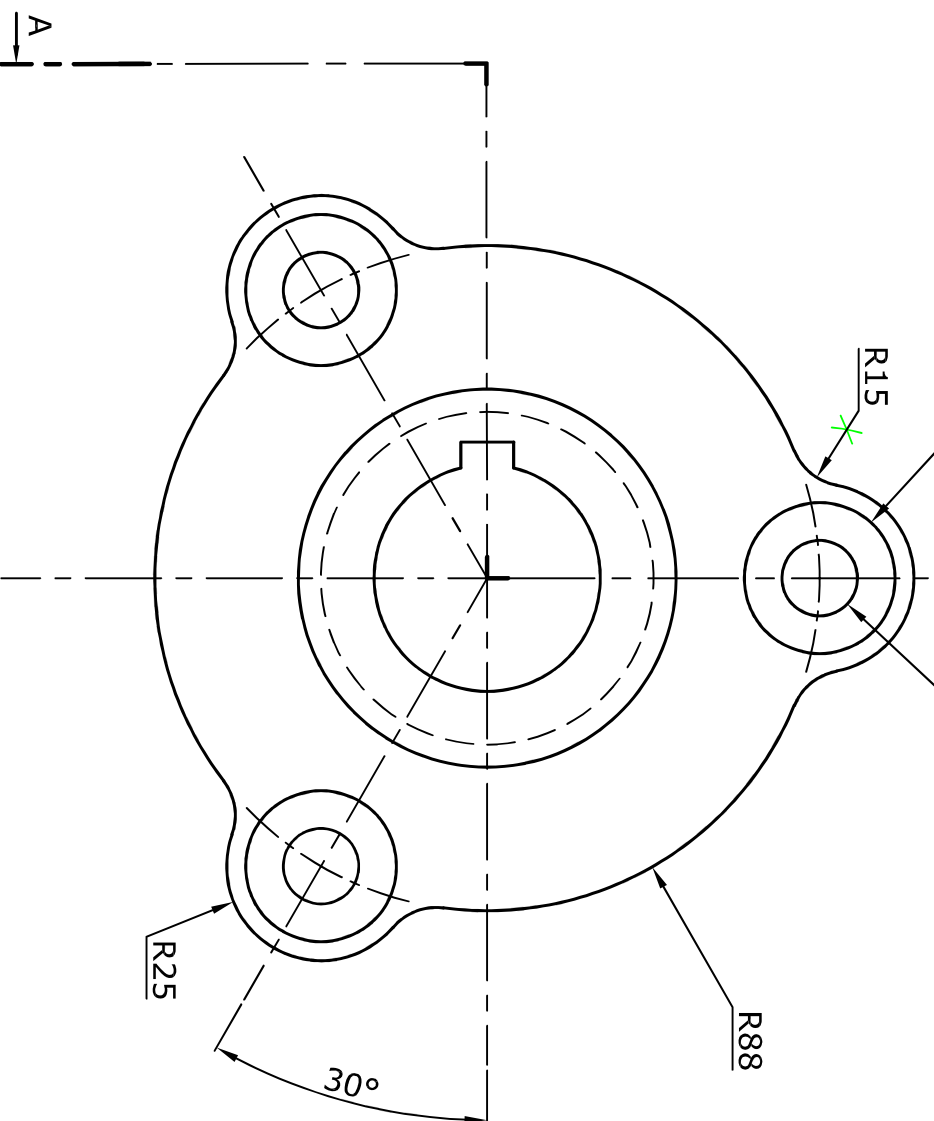
(ITEM 3) KEY



(ITEM 2) LEFT QUART



(ITEM 4) RIGHT HAND HALF OF COUPLING



(ITEM 6) KEY