MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
MAY 2017

SUBJECT:	ENGINEERING DRAWING/GRAPHICAL COMMUNICATION
PAPER NUMBER:	I
DATE:	3rd May 2017
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.

Attempt any **FIVE** 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. unless otherwise stated, all construction lines must be left in 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.

Question 1

The beam shown in Figure 1, consists of two girders hinged together. The beam rests on three supports, represented by reaction RL, RM and RR forces. The beam carries a uniformly distributed load of 10 kN/m and concentrated loads of 50 kN and 80 kN.

a) Copy the given space diagram using a scale of 10 mm representing 1 m and, using Bow's notation, print letters between the adjacent forces. (7)

b) Draw the vector diagram using a scale of 10 mm representing 10 kN and the polar diagram. (4)

c) Construct the: (i) shear force diagram; (2)
(ii) bending moment diagram. (3)

d) Determine graphically the: (i) reaction forces RL, RM and RR ; (2)
(ii) the position and magnitude of the greatest bending moment. (2)

(Total: 20 marks)

SPACE DIAGRAM

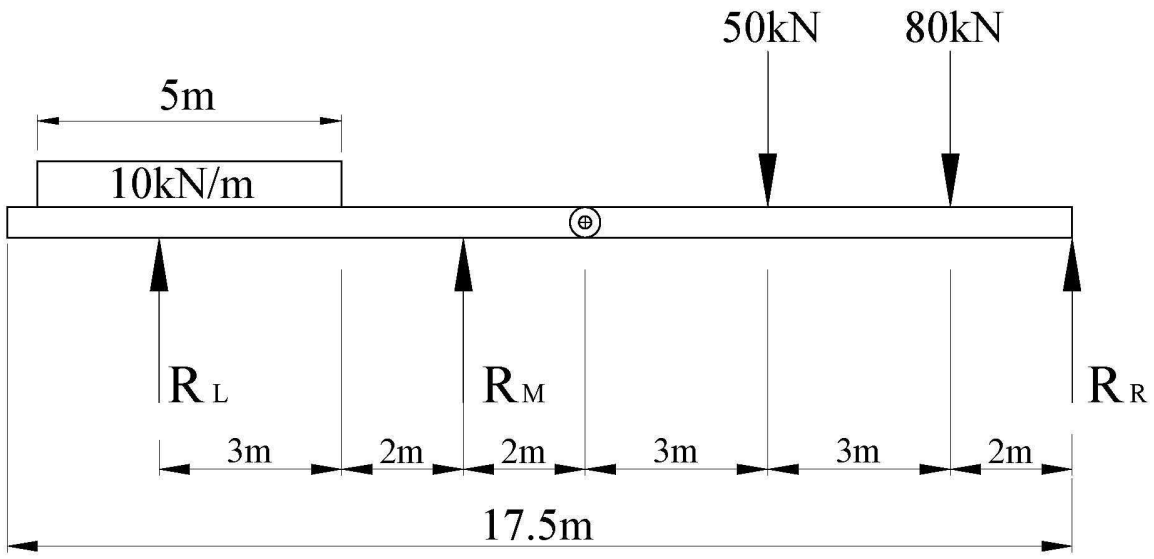

Figure 1

Question 2

A hexagonal bar is machined as shown in Figure 2a.
The hexagonal bar in Figure 2b is shown resting on one edge on a horizontal plane and parallel to the vertical plane.

a) Copy the front and end elevation shown. (3)
b) Draw the XY line in a suitable position. Use letters/numbers in the appropriate positions to illustrate the construction method. Complete the plan. (3)
c) Draw the X_1-Y_1 at the angle as shown and project the auxiliary plan. (6)
d) From the auxiliary plan, project the auxiliary elevation on the X_2-Y_2 line. (8)

(Total: 20 marks)

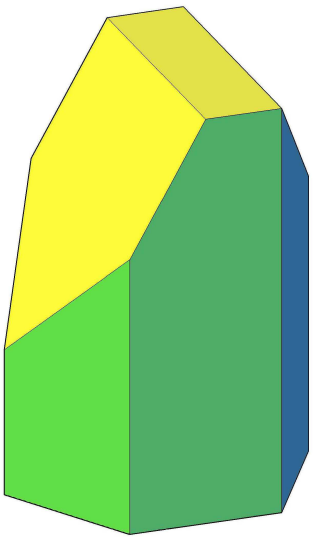

Figure 2a

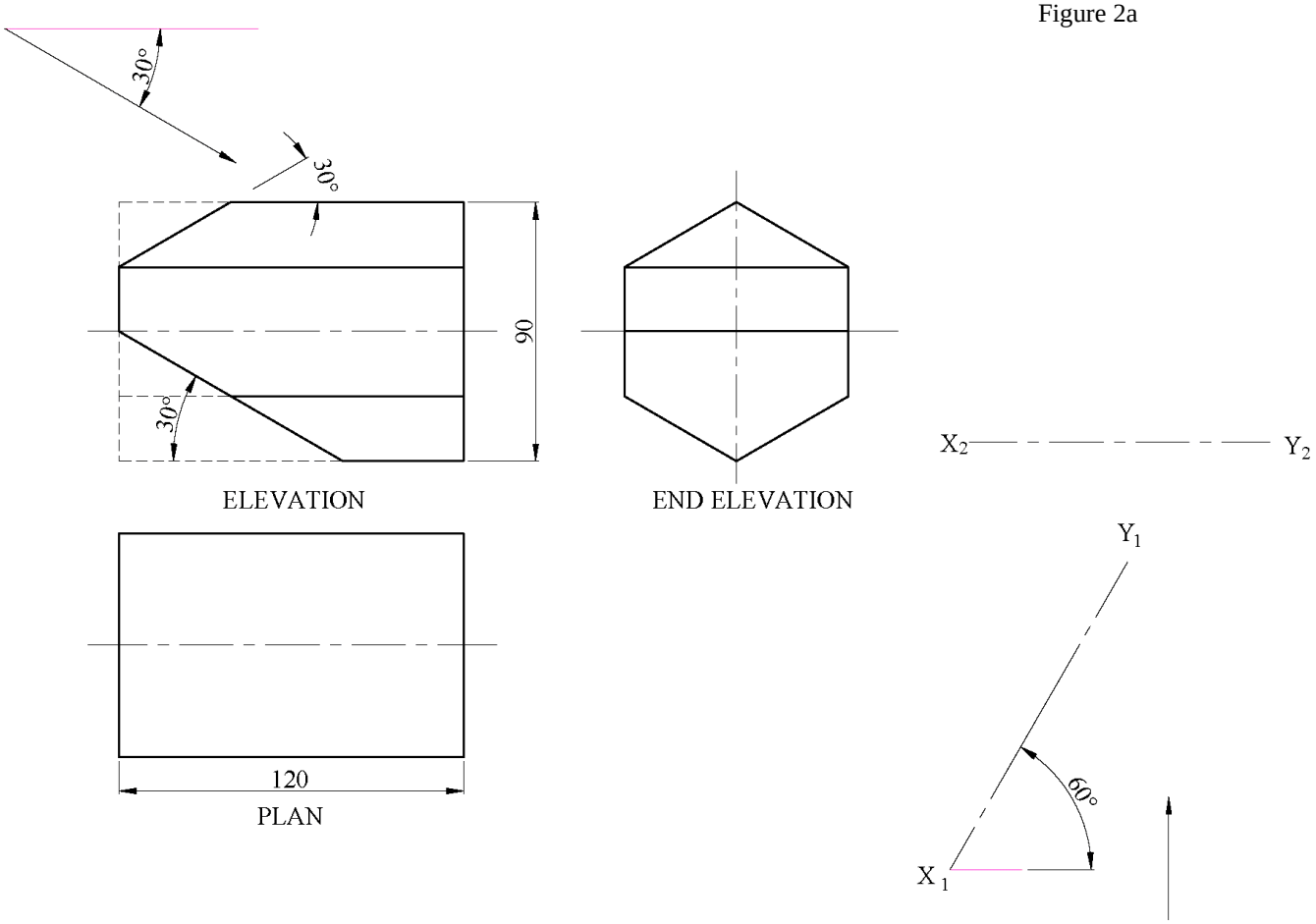

Figure 2b

Question 3

A hemi-sphere needs to be punched right through to accommodate a combined semi-cylindrical and a triangular prism as shown in Figure 3a.

a) Copy, full size, the complete plan of the hemi-sphere shown in Figure 3b. (2)

b) Complete the front elevation showing clearly the curves of intersection. (8)

c) Project an elevation in the direction of the arrow M. (10)

Show hidden detail.

(Total: 20 marks)

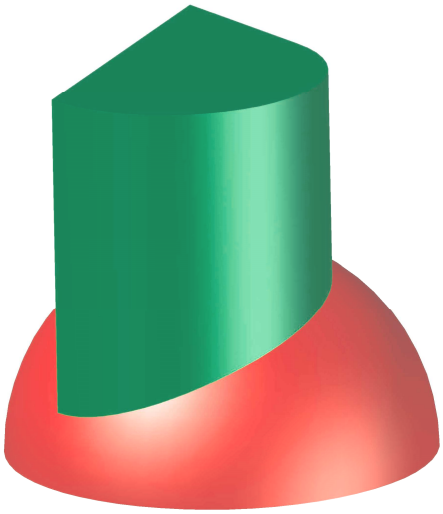

Figure 3a

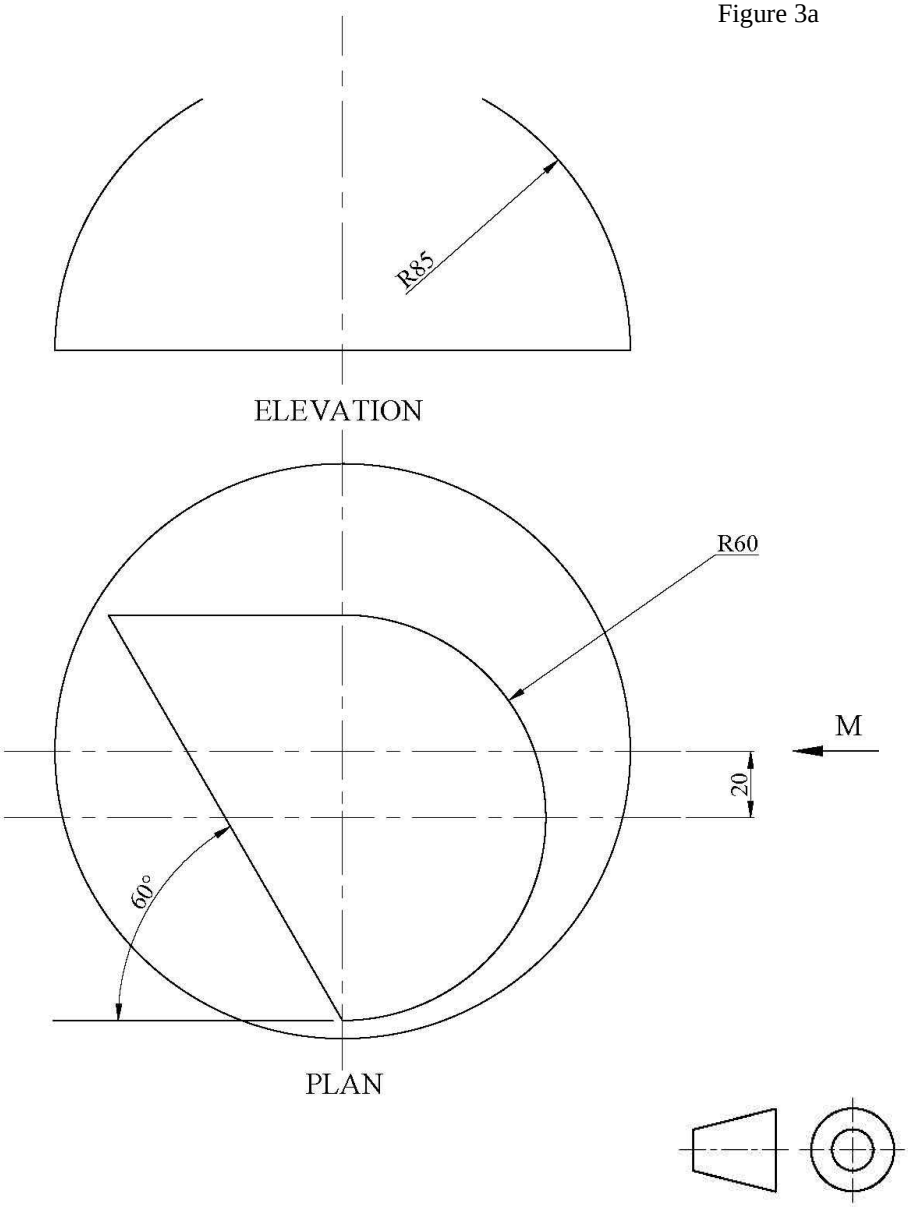

Figure 3b

Question 4

A solid with a pentagonal base and an equilateral triangular top, resting on the horizontal plane, is shown in Figure 4. The traces of an oblique plane, VT and HT, cut the solid.

a) Copy full size the given plan and elevation. (3)
b) Construct an auxiliary elevation, showing the oblique plane represented as an inclined plane. (3)
c) Project a plan with the portion above the cutting plane removed. (5)
d) Project the elevation. (5)
e) Draw a true shape of the section. (4)

Note:
Do not show section hatching but show hidden detail.

(Total: 20 marks)

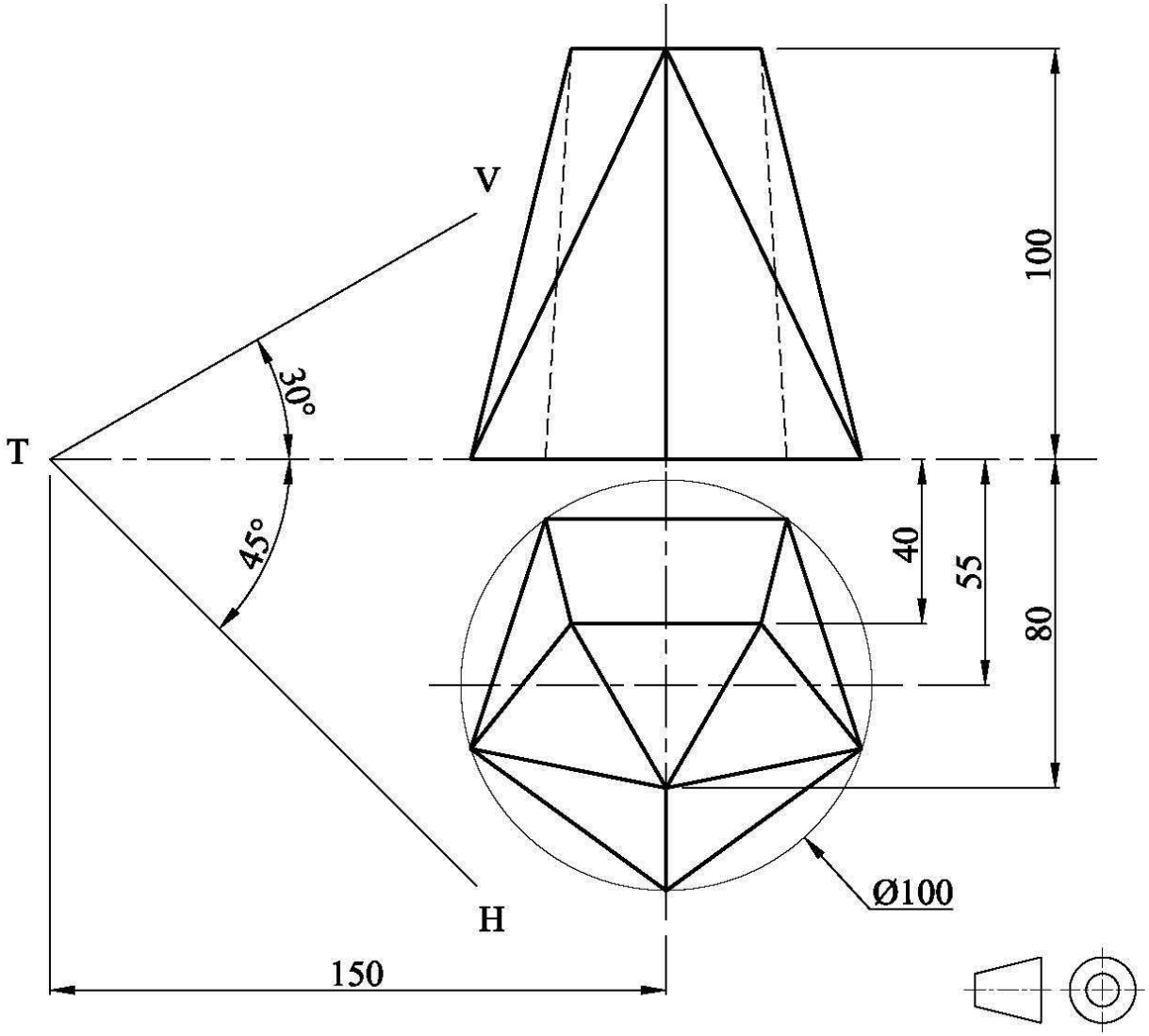

Figure 4

Question 5

A plate is folded to a specified angle, forming two triangles ABC and ABD joined together to a common edge AB.

a) Copy, full size, in third angle projection, the plan and elevation of the two triangles shown in Figure 5. (4)

b) Draw a first auxiliary view of the two triangles showing the true length of the intersecting line AB. (4)

c) From the first auxiliary view project a second auxiliary view showing the line AB as a point and each plane as an edge. Measure and state the true size of the angle. (4)

d) Construct the true shape of:

(i) **ONE** triangle by projecting from the second auxiliary view; (4)

(ii) the other triangle by constructing the true length of the sides; (3)

(iii) use dimension lines to indicate the lengths of the sides of both triangles. (1)

(Total: 20 marks)

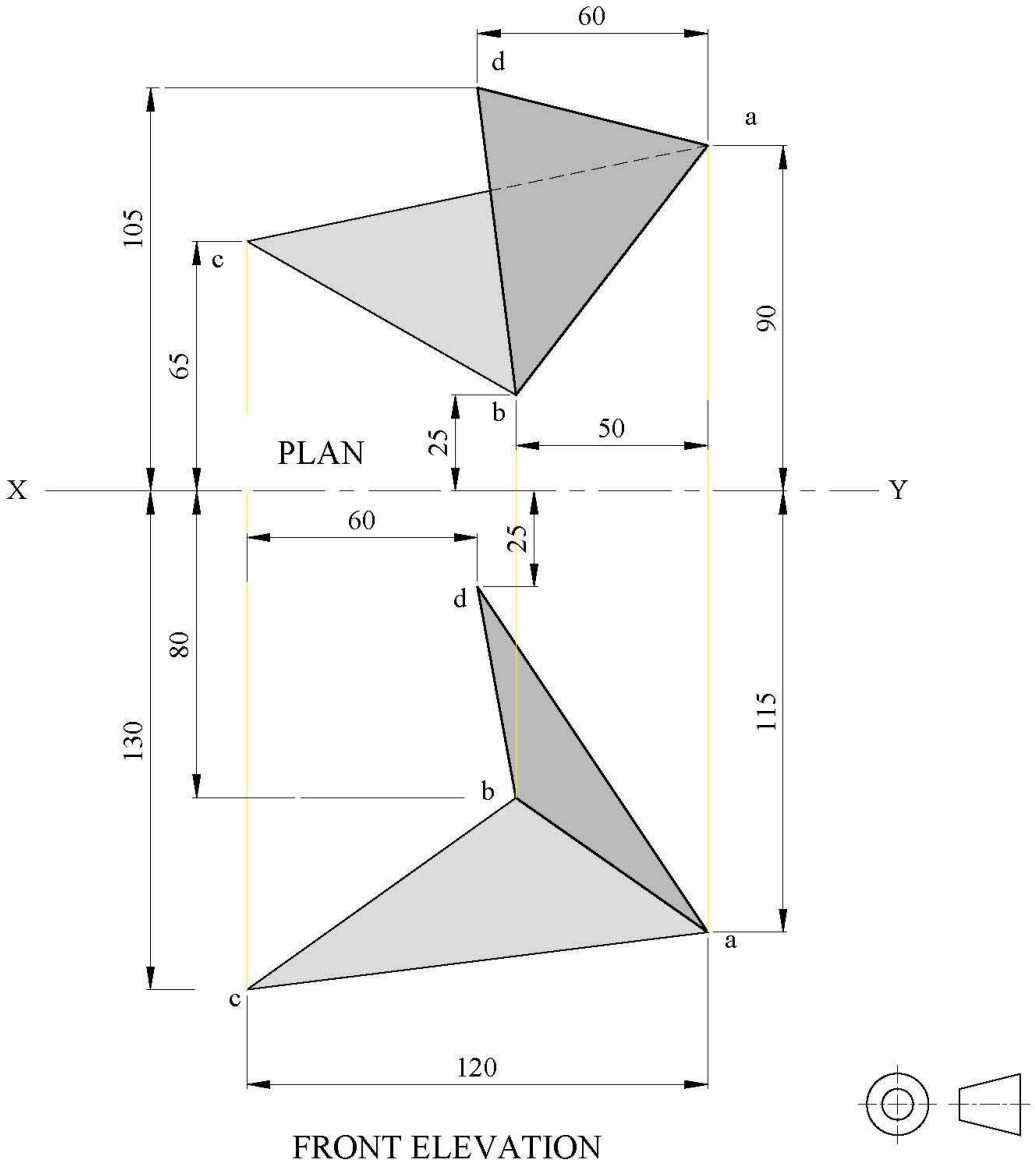

Figure 5

Question 6

The centre line of a roller-ended follower is offset 35 mm to the left of the line of action and inclined to the cam axis of a disc cam as shown in Figure 6.
The roller oscillates to give a lift of 70 mm in one revolution. The minimum distance from the cam axis to the roller centre is 60 mm. The specification of the motion is as follows:

Cam rotation (Anticlockwise)	Follower movement and types of motion
0° to 120°	Follower to rise 50 mm on the inclined line with simple harmonic motion
120° to 180°	Follower to rise 20 mm with uniform velocity
180° to 330°	Follower to fall 70 mm with uniform acceleration and retardation on the inclined centre line
330° to 360°	Follower to dwell

a) Construct a suitable motion displacement curve diagram. (7)
b) Copy Figure 6 and project the necessary points to construct the locus of the centre of the roller follower circle and draw the required cam profile. (13)

(Total: 20 marks)

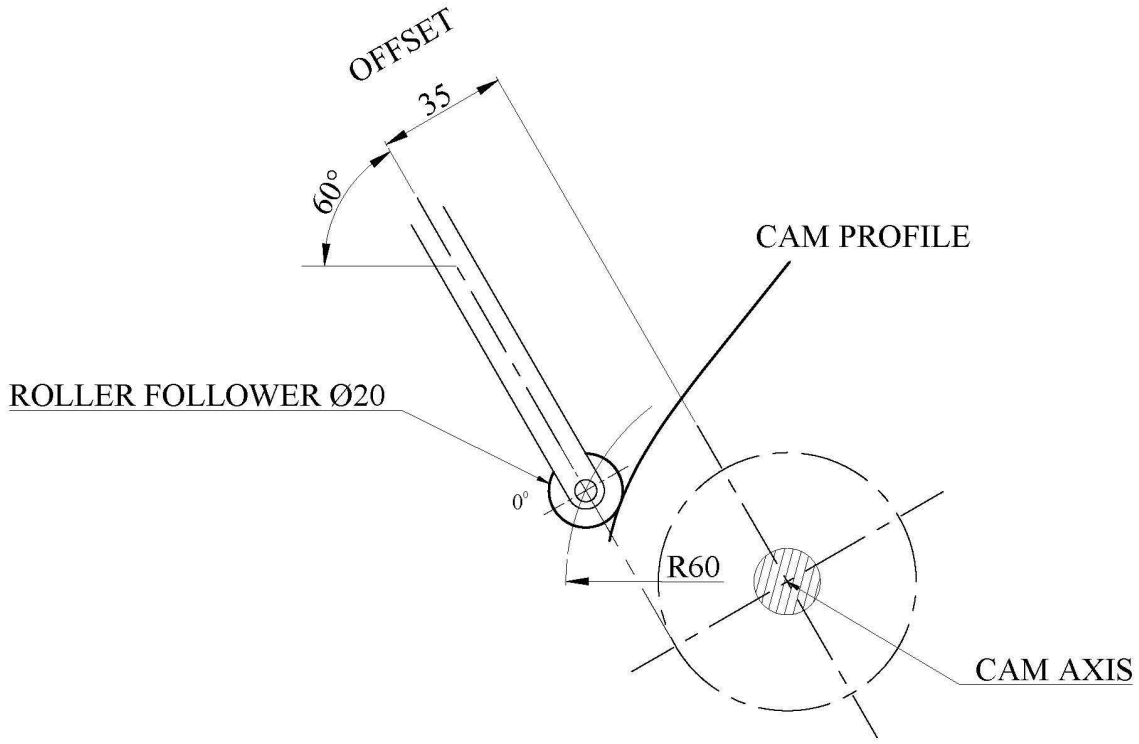

Figure 6

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

MATRICULATION EXAMINATION
ADVANCED LEVEL
MAY 2017

SUBJECT:	GRAPHICAL COMMUNICATION
PAPER NUMBER:	II
DATE:	4th May 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.

Question 1

A front elevation and a plan of a wedding gazebo are given in Figure 1. The eight-sided structure, which is to be erected on a 16 tiles x 16 tiles garden patio, consists of the following items:

- platform;
- curtain columns;
- pyramidal roof with hanging top curtains;
- one step which leads to the front entrance of the gazebo;
- carpet covering the middle area of the step and of the platform;
- small table to be placed at the centre of the gazebo.

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

You are to meet this requirement by drawing a one-point estimated perspective view. The viewing direction required is indicated by the arrows 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 structure. (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 25 mm.
- Each unit in the vertical scale represents 25 mm.
- You are expected to apply colour/tone/texture to the right-hand half of your drawing.

(Total: 34 marks)

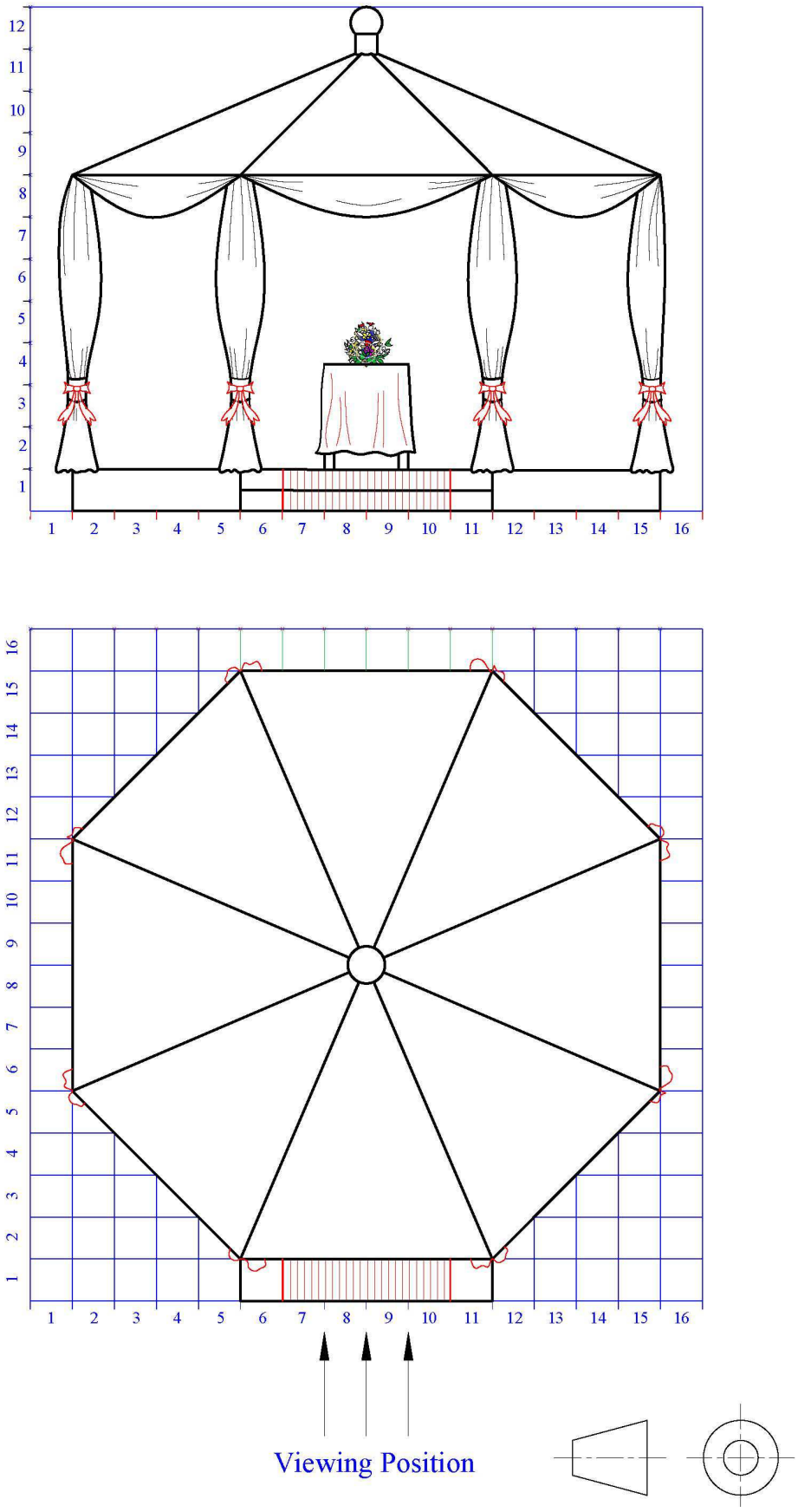

Figure 1

Question 2

PMS, Property Maintenance Services, is a business which offers a complete handyman service to home owners and property managers. Due to a rebranding campaign, the company will be requiring a new logo design. The following are the main requirements:

- an overall square shape to fit business cards, Facebook etc;
- three colours maximum;
- simple, yet eye-catching design which can be embroidered onto uniforms.

You have been asked to submit your proposed logo design.
Your presentation has to follow the steps given below and organised as indicated in Figure 2.

a) Written analysis
Identify, using keywords/short phrases, the main parameters of the design brief. (2)

b) Graphical analysis
Based on your response to part (a), produce a series of preparatory 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 a square frame. (14)

(Total: 22 marks)

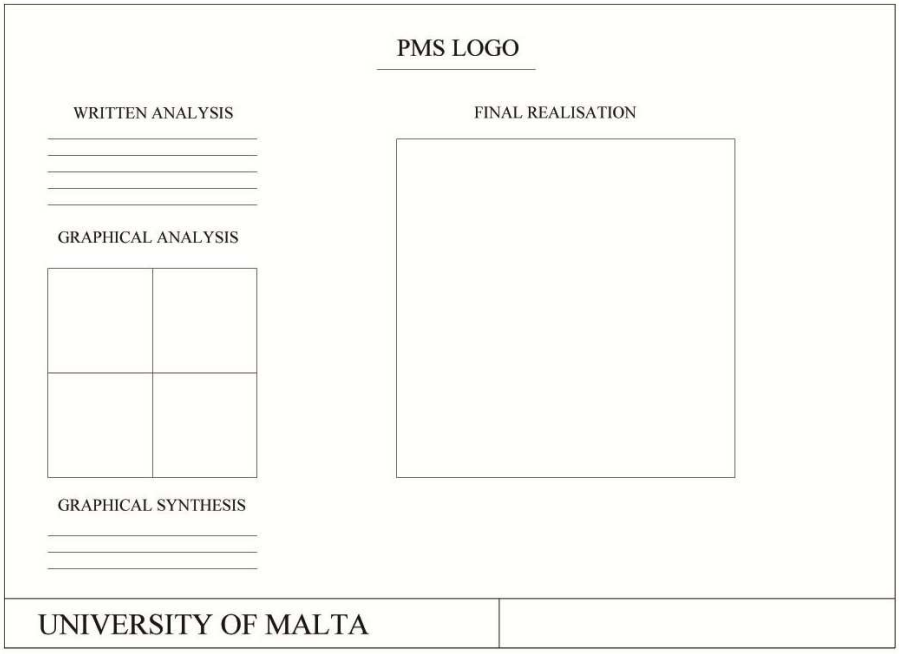

Figure 2

Question 3

Three orthographic views of an electric sewing machine are given in Figure 3. The company requires a freehand illustration to promote the new product. You are requested to draw:

a) **TWO** small preparatory sketches to explore the most representative viewing angle and indicate the chosen sketch. (4)
b) Larger and more detailed freehand 3-D sketch of the sewing machine. (12)
c) Suitable background. (2)
d) Use your preferred drawing medium or media to colour and shade the final sketch. (4)

Note: Marks will be awarded for proper use of colours to represent textures and forms.

(Total: 22 marks)

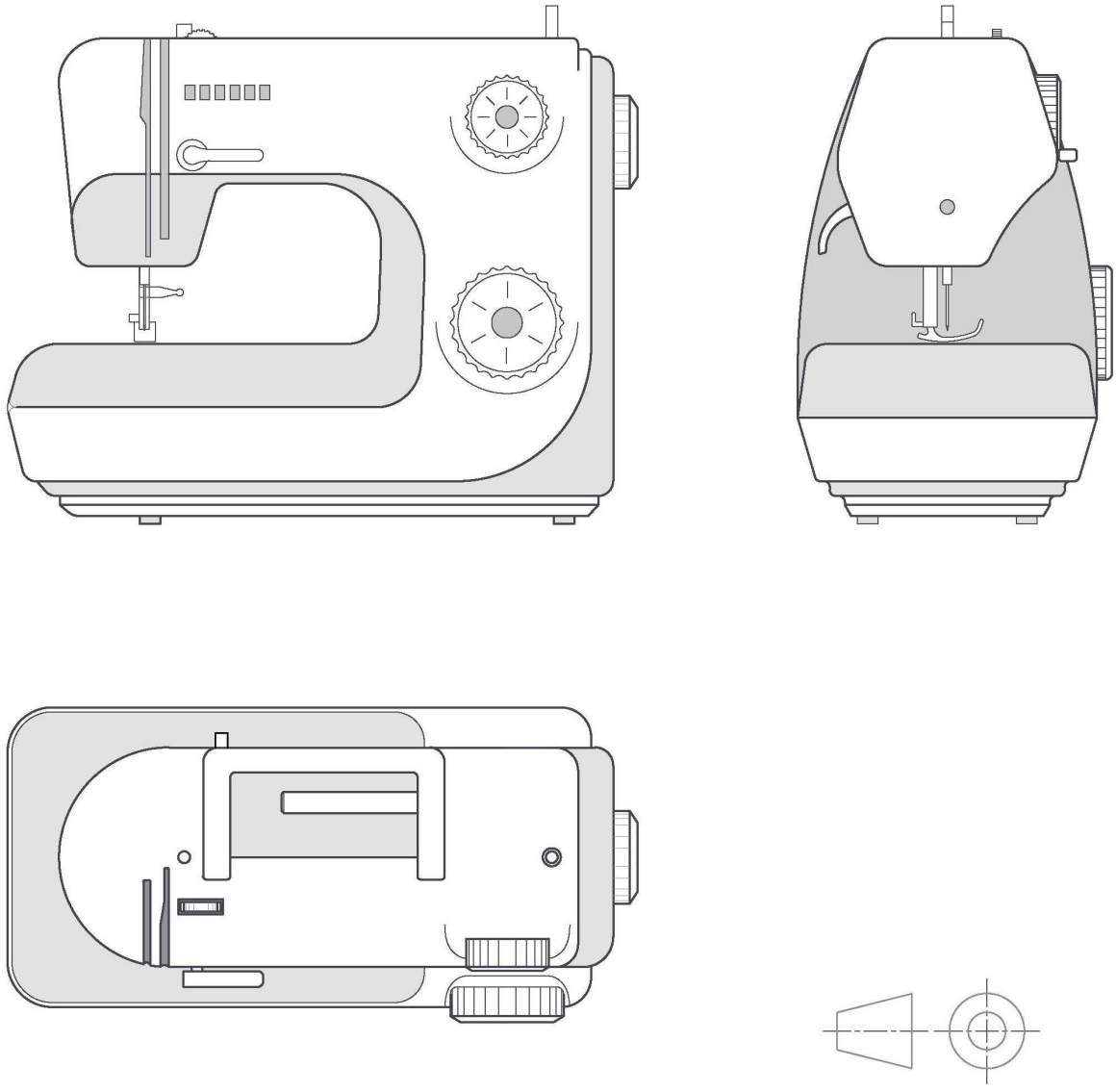

Figure 3

Question 4

Research seems to indicate that listening to music in the workplace has a positive effect on employee productivity because it lessens boredom. More specifically, music makes people more productive because it makes them happier.

A presentation about the research findings is being prepared and you have been asked to design a simple and condensed poster with the following title:

Music boosts happiness, which improves productivity.

The poster should consist of a combination of text and graphic symbols.

a) Use a section of your drawing sheet to draw your exploratory sketches. (8)
b) Draw the final poster on the same sheet. (14)

Notes:
Marks will be awarded for:

- suitable layout;
- balanced composition of the poster;
- condensation of ideas;
- simplicity;
- appropriate typefaces;
- proper use of colours;
- visual impact.

(Total: 22 marks)