

AM 09/I.12m – AM 15/I.12m

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

**MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL
MAY 2012**

SUBJECT:	ENGINEERING DRAWING / GRAPHICAL COMMUNICATION
PAPER NUMBER:	I
DATE:	7th May 2012
TIME:	9.00 a.m. to 12.00 noon

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.

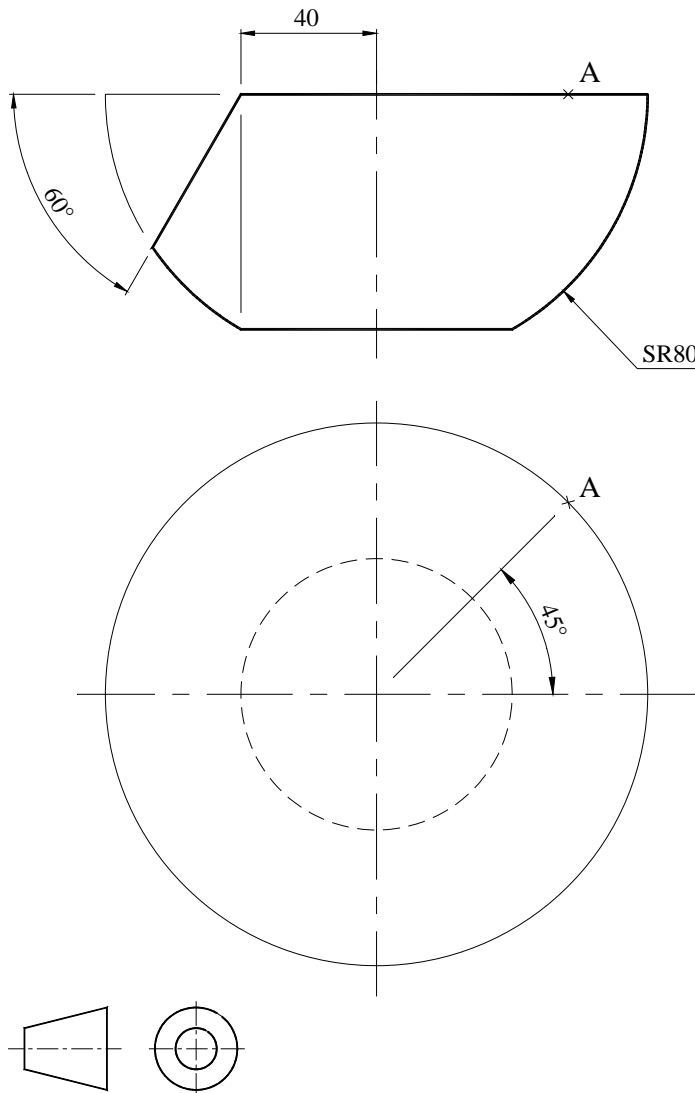
Mark allocations are shown in brackets.

Question 1

A Table Football tournament trophy has the form of a table football player. The base of the trophy is a hemisphere cut by two separate planes. The cut at the bottom provides a stable footing, whereas the cut on the side provides space for the nameplate of the trophy.

- i) Construct an isometric scale covering full-scale lengths up to 100mm. (2 marks)
- ii) Copy the given projections of the trophy base **using isometric measurements** and complete the plan. (8 marks)
- iii) **Project** isometrically the trophy base. Orientate your view such that point A occurs at the topmost point. **Hidden detail is required.** (10 marks)

(20 marks total)



Question 2

A bar of rectangular cross-section is turned on a lathe to form a round bar having the greatest possible diameter. One end is radiused off to a bell-shape to obtain the palm-ended rod described below.

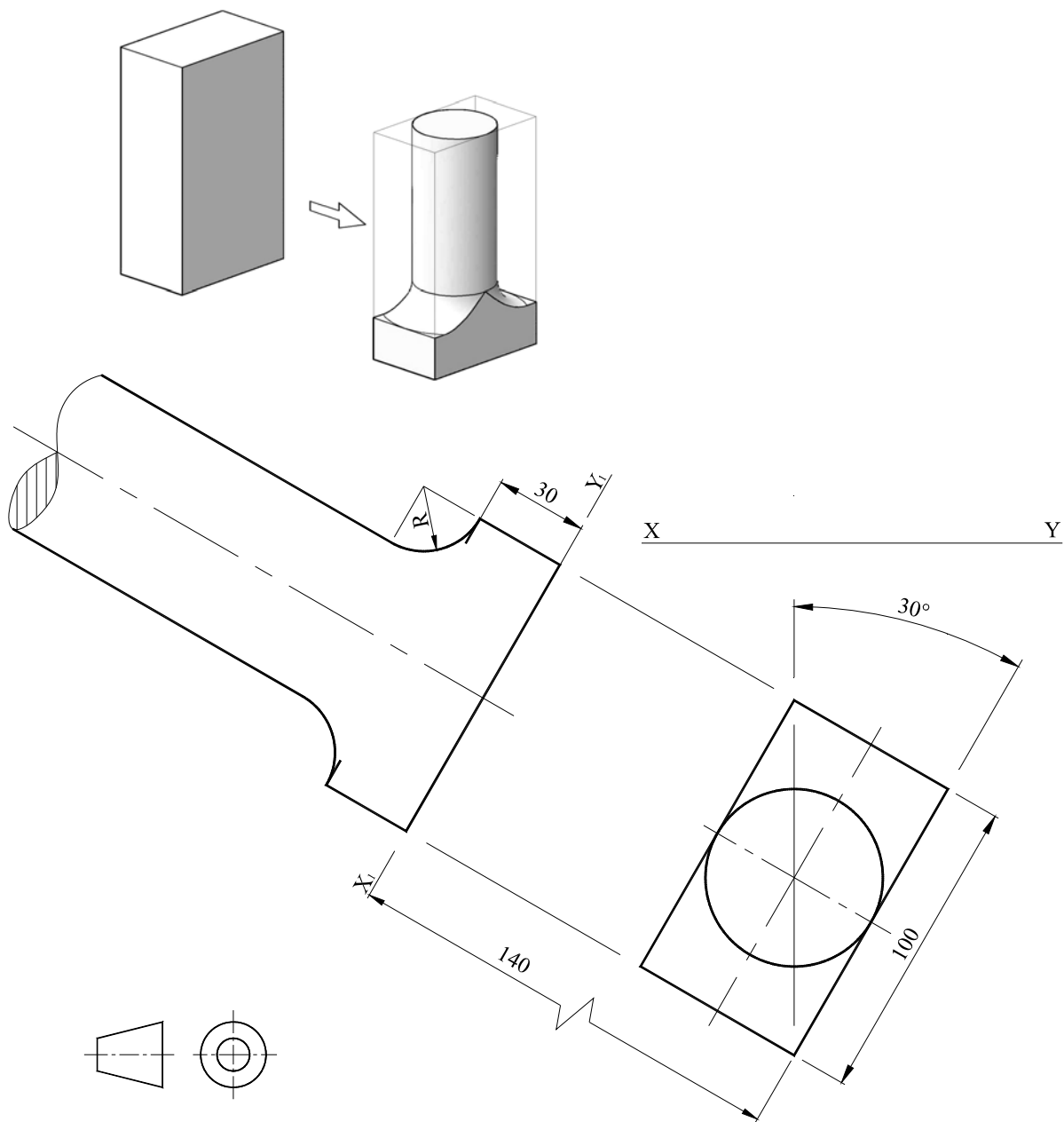
The rod is arranged so that the palmate section shows up truly in an auxiliary elevation.

i) Copy the given orthographic views. (2 marks)

ii) Derive the palmate section looking on X_1Y_1 . (8 marks)

iii) Deduce the ordinary elevation looking on XY . (10 marks)

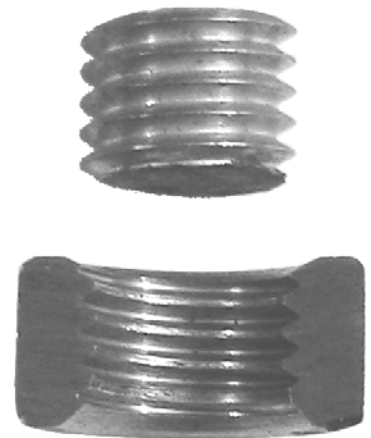
(20 marks total)



(Please turn the page)

Question 3

The figures below on the left, represent a matched pair of male and female threads. Figure 3.1 shows a common external 60° vee thread whereas Figure 3.2 represents a corresponding internal thread cut out of a block of metal.



In a similar way and according to the scheme given in Figure 3.3, draw a matched pair of square threads having the following specifications:

- Pitch of thread = 24mm
- Major diameter = 110mm
- Hand of thread = Left
- No. of starts = 2

Hidden detail may be left out.

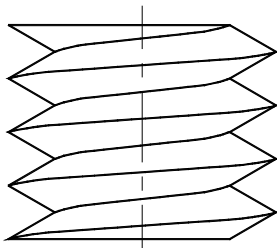
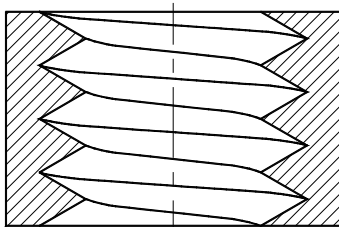
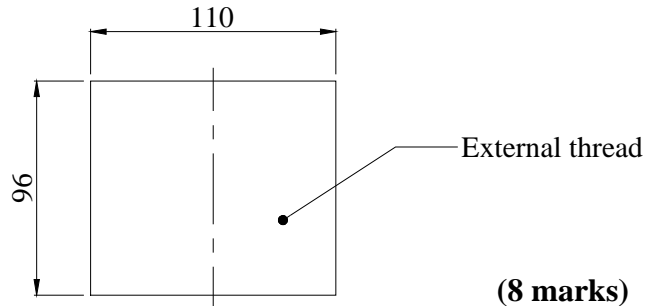


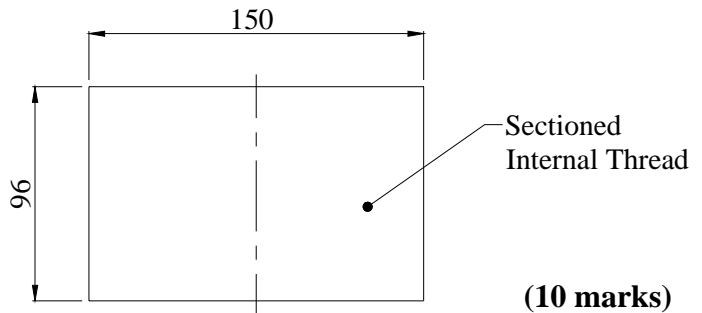
Figure 3.1



SECTION Y - Y



(8 marks)



(10 marks)

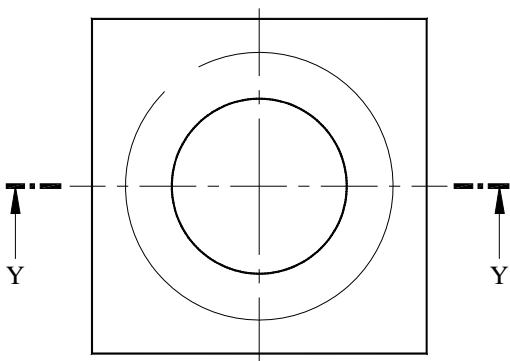
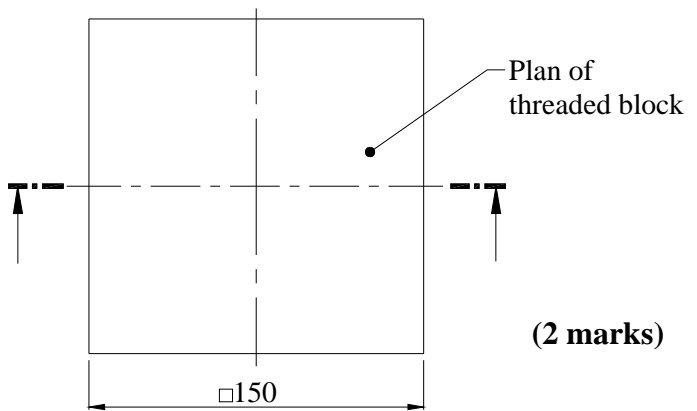
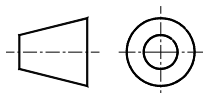


Figure 3.2



(2 marks)

Figure 3.3



(20 marks total)

Question 4

- a) Figure 4.1 represents an oblique plane VTH and two lines AB and BC. Using the technique of auxiliary projection, determine:
- i) the angle the oblique plane makes with the HP. Record the angle to the nearest degree. **(2 marks)**
 - ii) whether each of the lines intersect with the oblique plane. If intersection does occur, locate the points of intersection in the plan and front elevation. **(2 marks)**
- b) A third line CA is introduced such that the 3 lines now represent the edges of a triangular plane ABC. Find the line of intersection that results between the plane ABC and the oblique plane VTH, updating the plan and front elevation accordingly. **(4 marks)**
- c) A tetrahedron (triangular pyramid) is formed by assuming a vertex D and joining to each corner of plane ABC, Figure 4.2. The oblique plane VTH cuts through the tetrahedron. Assuming a solid tetrahedron, deduce the plan and elevation of the part tetrahedron that lies below the plane VTH. **(12marks)**
(20 marks total)

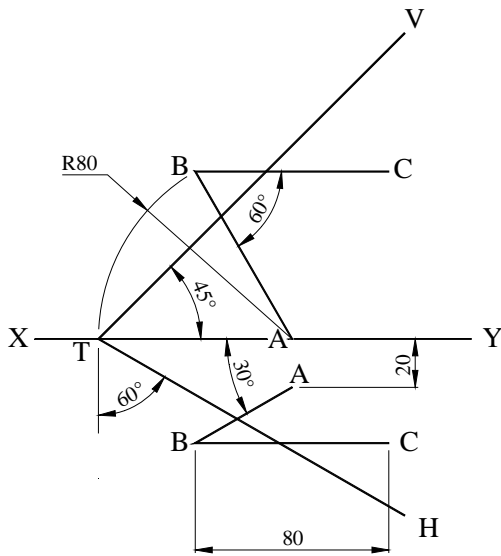


Figure 4.1

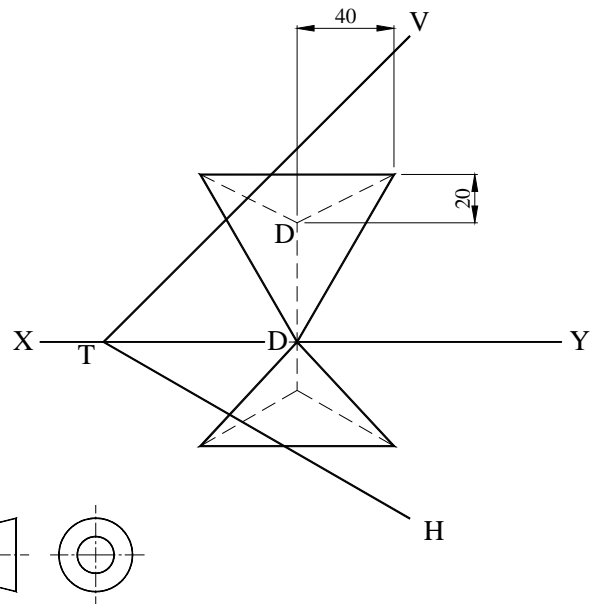
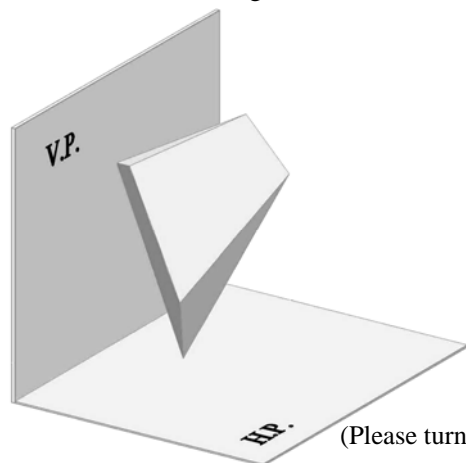
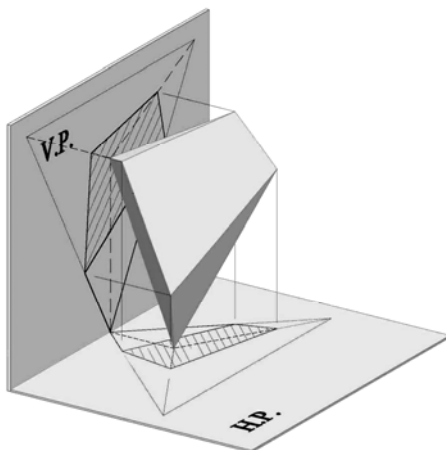


Figure 4.2



(Please turn the page)

Question 5

A simple spur gear train is required to provide a speed reduction of 1.5:1. The driven wheel must rotate in the **same** direction as the driving pinion. This is achieved by employing an idler gear having the same size as the pinion. The 3 gears are coplanar and also share the same horizontal plane passing through their centres. If the **overall** centre distance equals 144mm and the wheel has 12 teeth, find the value of the module to be used by the gear train.

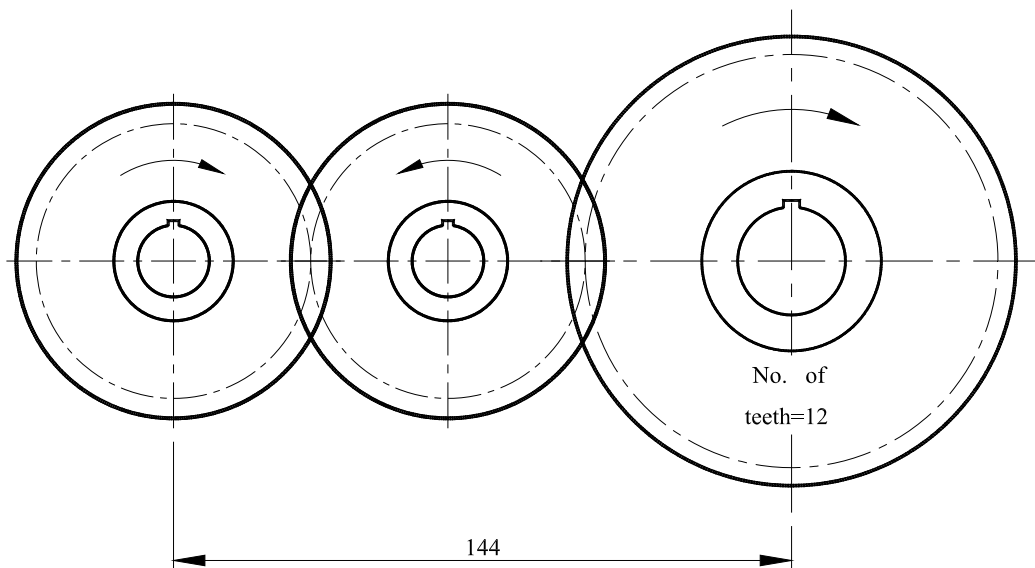
(8 marks)

To a scale of 2:1 draw the two gears that will bring about the required gear ratio. You must show two consecutive meshing teeth of each gear. The gears use a pressure angle of 20° and the teeth are of involute form.

(12 marks)

One tooth of each gear must be drawn using the true involute form, whereas the other may be constructed using approximate geometric methods. The calculations made must be neatly printed and the derived data presented in table form.

(20 marks total)



Question 6

Figure 6.1 represents a simplified beam model of the real-life structure shown in Figure 6.2. The beam carries two uniformly distributed loads and a point load as indicated.

Using a space diagram scale of 10mm representing 0.5m, a force diagram scale of 10mm representing 10kN and a polar distance of 50mm, determine graphically:

- i) the magnitudes of the reactions R_L and R_R ; **(8 marks)**
- ii) the shear force diagram; **(4 marks)**
- iii) the bending moment diagram; **(4 marks)**
- iv) the magnitude, position and nature (i.e. whether sagging or hogging) of the maximum bending moment. **(4 marks)**

(20 marks total)

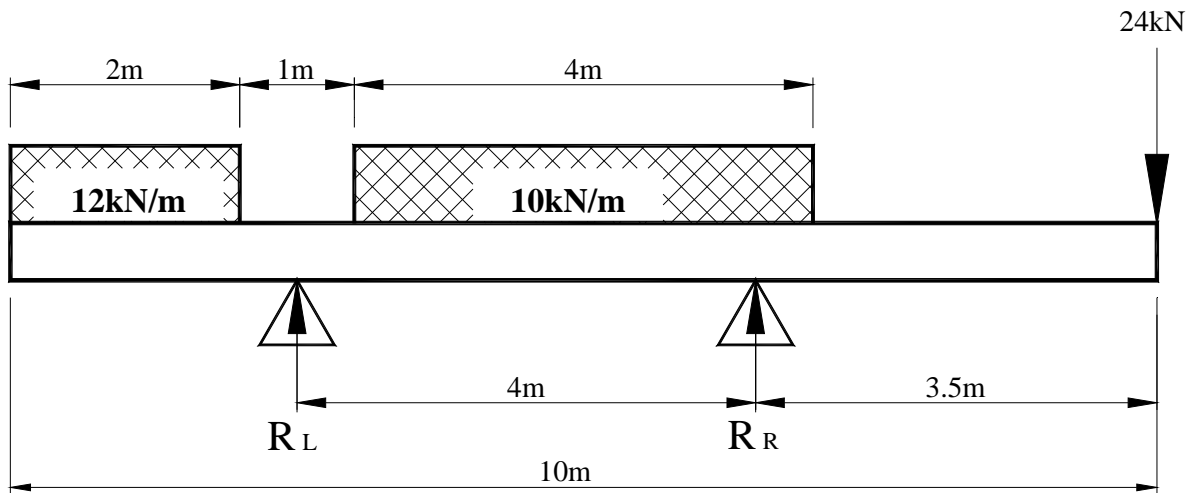


Figure 6.1

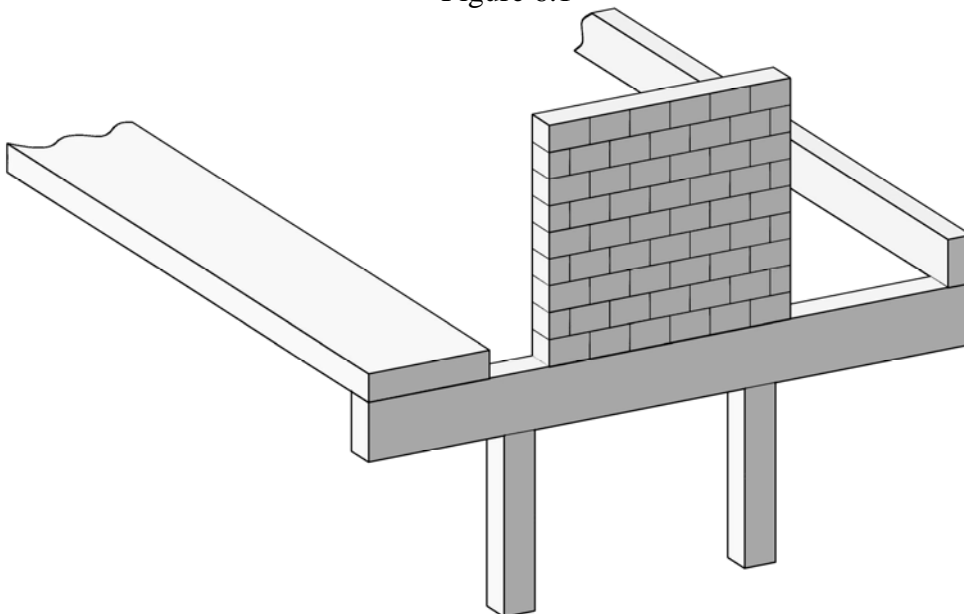


Figure 6.2

End of examination paper

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UNIVERSITY OF MALTA, MSIDA

**MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL
MAY 2012**

SUBJECT:	GRAPHICAL COMMUNICATION
PAPER NUMBER:	II
DATE:	8th May 2012
TIME:	9.00 a.m. to 12.00 noon

Directions to Candidates

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

Attempt **question 1** and any other **THREE** 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;
- all construction lines must be left on 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 should be used where appropriate.

Mark allocations are shown in brackets.

Question 1 carries 34 marks. Questions 2, 3, 4 and 5 carry 22 marks each.

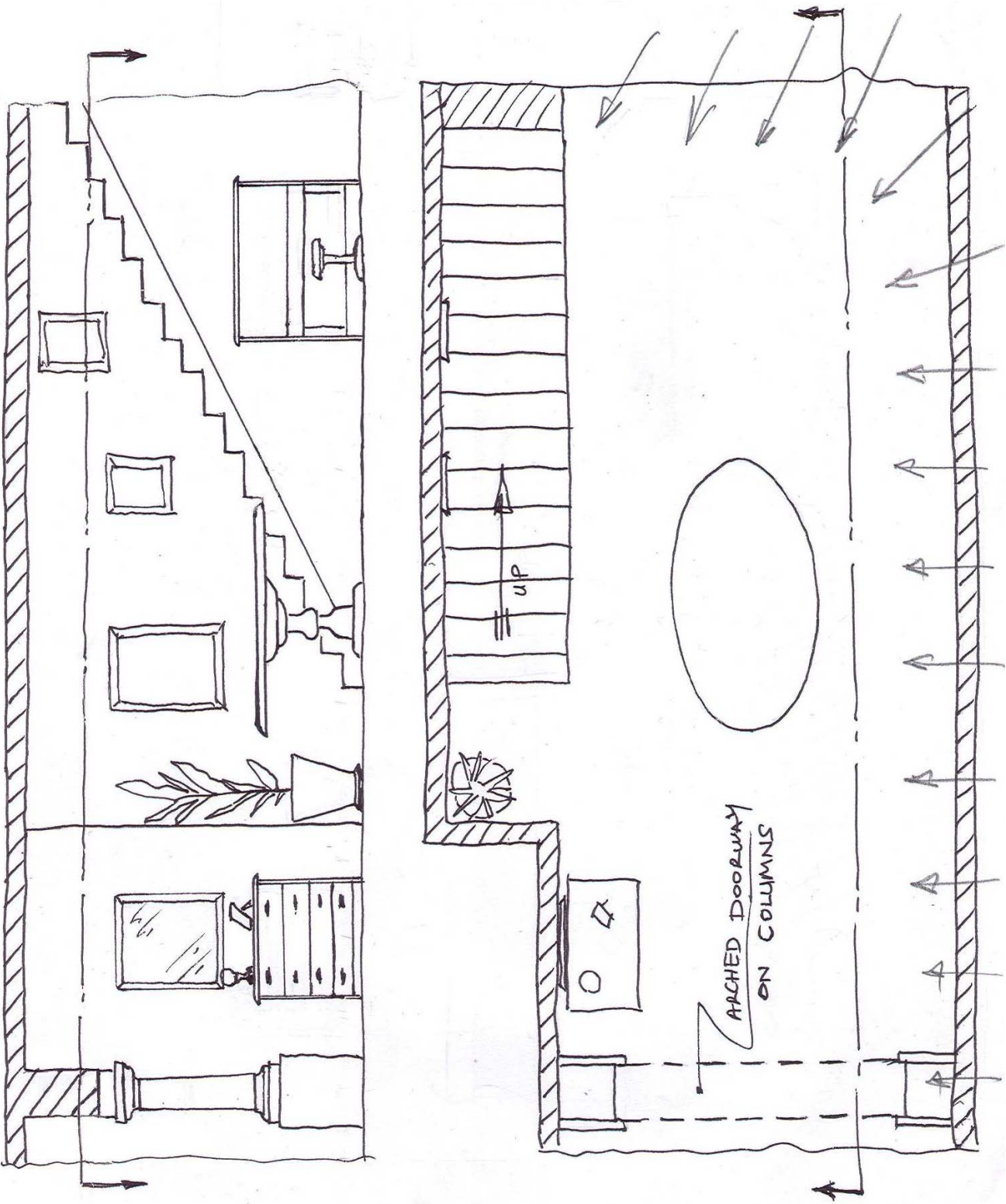


Figure 1

Question 1

Figure 1 on the opposite page shows sketches that a designer has produced for an entrance hall of a house. These views constitute an integral part of the design process, but fail to convey a feeling of the **3D** proportions of the area concerned. You are to meet this requirement by drawing a **suitable one-point estimated perspective drawing**. The viewing direction required is indicated by the arrows at the bottom of the figure.

- i) Using **three** preliminary sketches, explore alternative positions of the horizon line and identify the one which, in your opinion, best describes the spaciousness of the layout. **(3 marks)**
- ii) Based on your choice made in (i), produce the required illustration on a single side of an A2 size paper making the best use of the space available. **(25 marks)**
- iii) Enhance your answer graphically using colours, tone and texture, suggesting also suitable materials. **(6 marks)**
*You are not expected to apply colour/tone/texture to your whole illustration. You are advised to limit their use to a small area on each **different** item appearing in your illustration.*

(34 marks total)

(Please turn the page)

Question 2

A large DIY store decides to publish a series of ‘back-to-basics’ graphic leaflets aimed primarily at junior clients. These will be made freely available at the retail counters of the store.



The first leaflet of the collection explains **how to hammer a nail**. The leaflet specifically depicts the steps given below:

1.	Fetch a claw hammer of suitable size.
2.	In one hand, grab the hammer comfortably towards the end of its handle. The flat part of the head should be pointing down as this is the side used for hammering.
3.	In the other hand, hold the nail between the first (index) finger and the thumb and position it where required.
4.	Hit the nail head directly in its centre, taking care that the impact occurs squarely, i.e. on impact the hammer handle and the nail shaft are approximately perpendicular.

You are commissioned to design such a leaflet. The leaflet shall consist of the **two** internal sides of a folded A4 sheet. The layout is for you to decide but it must allocate a defined space/window for each **numbered** step, to facilitate logical sequencing. **Only steps 2, 3 and 4 are to be designed in detail, with the window for step 1 being left empty.**

*The leaflet **must not** make use of any words except for the title ‘HAMMERING A NAIL’.*

The overall leaflet layout and the detailed designs of steps 2, 3 and 4 are to be attempted following the stages given below. Each part of your work must be clearly identified.

i) **Written analysis**

Identify, using keywords/short phrases, the main parameters you consider relevant when designing the leaflet layout and steps 2, 3 and 4. **(4 marks)**

ii) **Graphical analysis**

Based on your response to (a), produce 2 sketches in respect to the leaflet layout, and 2 sketches for each of steps 2, 3 and 4.

Your sketches need not necessarily represent new concepts; a development of the same idea would be acceptable.

(8 marks)

iii) **Graphical synthesis**

Clearly identify those elements produced in your response to (b) that you intend to use in your final images.

(1 mark)

iv) **Final Realisation**

Produce the final combined solution for the whole leaflet.

Marks are awarded for the appropriateness of design and the use of colour.

(9 marks)

(22 marks total)

Question 3

Preliminary Information

The National Road Safety Council is concerned over the ever increasing number of drivers using handheld mobile phones whilst travelling. The authority intends to run a campaign to curb down such irresponsible practices.

You have been asked to design suitable ideogrammatic images that will feature on large billboards set up on the roads.

Design brief

Design ideogrammatic images to accompany the words:

**ALWAYS KEEP YOUR HANDS FREE WHILE DRIVING.
TEXTING OR MAKING CALLS IS A CRIME.**

These words should provide a focus for your design.

You are not required to include these or any words in your designs. Concentrate only on the images. Your work must be broken down in the steps given below, with each part being clearly identified.

- i) **Written analysis**
Identify, using keywords/short phrases the main parameters of the problem.
(3 marks)
- ii) **Graphical analysis**
Based on your response to (i), produce a series of sketches (minimum of 3) that graphically illustrate your developing ideas.
Your sketches need not necessarily represent new concepts; a development of the same idea would be acceptable.
(6 marks)
- iii) **Graphical synthesis**
Clearly identify those elements produced in your response to (ii) that you intend to use in your final images.
(1 mark)
- iv) **Final Realisation**
Produce your final solution to the problem.
Marks are awarded for the appropriateness of design and the use of colour.
(12 marks)

(22 marks total)

(Please turn the page)

Question 4

A family magazine intends dedicating a section to seasonal ‘back-to-school’ goods. A reviewer approaches you and asks you to help with **representing and comparing graphically**, the details of the sample of school backpacks given in the table below.



Model	Holding Volume in litres	No. of Compartments	Cost in €	Bag Fabric Quality	Shoulder Straps Quality	Anatomical Rear Panel Quality
A	12	2	25	2	5	3
B	16	3	40	3	4	2
C	16	2	35	3	5	5
D	18	3	50	4	2	2
E	16	4	45	5	3	3
F	20	4	55	5	4	3

Notes:

- The Bag Fabric Quality, Shoulder Straps Quality and the Rear Panel have been assessed across a 5 point scale, with 5 being the best.
- The Bag Fabric Quality refers to the toughness and durability of the cloth used in the manufacture of the backpack.
- The Shoulder Straps quality reflects the width of strap material used, the method of attachment to the bag and the amount of soft padding incorporated.
- The Rear Panel Quality represents how well the rear panel of the backpack is designed to respect the ergonomics and anatomy of the spine/back.

- i) A **3D** graphical representation is required to compare models A, C and E by way of their:
- a) holding Volume;
 - b) number of Compartments;
 - c) cost.

Clearly show the itemised information in an imaginative 3D block diagram form, reflecting also the theme **BACKPACKS**.

(12 marks)

- ii) A **2D** graphical representation is required to compare all the models by way of their:
- a) fabric quality;
 - b) shoulder Straps quality;
 - c) rear Panel quality.

Clearly show the itemised information using 2D block diagram(s) reflecting also the theme **BACKPACKS**.

(10 marks)

Although the use of colour is expected, it is sufficient to indicate where and how it will be used.

(22 marks total)

(Please turn the page)

Question 5

The Tourism Authority is considering publishing a leaflet that will help promote better the various locations across Malta and Gozo. The leaflet will be made freely available at the ports of entry to the country. The objective is to produce leaflets that overcome the barriers of language; to this end they must be as graphic as possible.

The idea is to make use of symbols to describe the attractions and activities associated with the different locations. The appropriate symbol/s will then be displayed on a map next to each location.

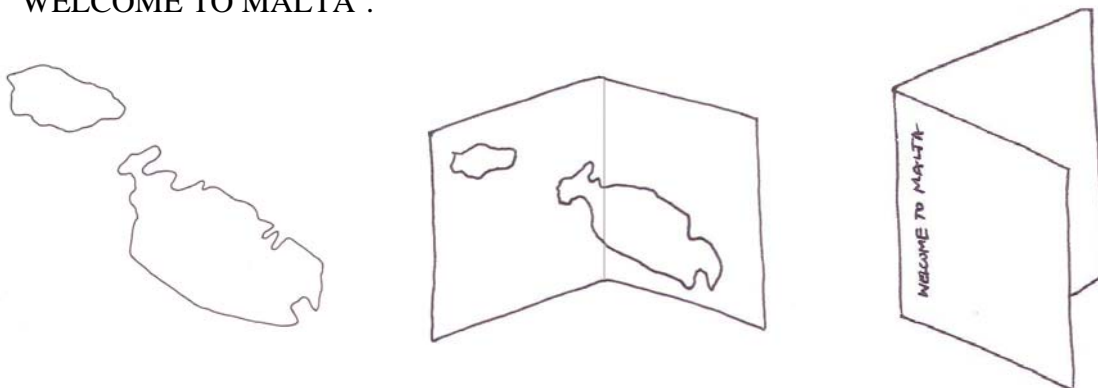
Symbols are required to represent:

- shopping facilities;
- sports complexes and facilities;
- recreational green parks and gardens;
- historical sites and monuments;
- beaches;
- accommodation facilities;
- eat and drink facilities;
- nightlife and clubbing.

- a) For each of the above 8 attractions/activities, develop an ideogrammatic symbol. In each case, the final symbol must be preceded by a preliminary sketch. The symbols must share the same format, style and size.

Your sketches need not necessarily represent new concepts; a development of the same idea would be acceptable. (16 marks)

- b) The leaflet shall consist of a folded A4 sheet. The detailed map, annotated with the symbols, will fill the two internal sides of the leaflet. The front external page will be of size A5. Use the eight symbols developed in (a), or their elements, along with a line map diagram of Malta as given below, to design the front external page. You are not required to reproduce in detail the work already developed in (a); you may choose to represent them roughly, or just represent their position, or even combine them to create a suitable design. **Your goal here is to design the front page.** Your design should carry the title 'WELCOME TO MALTA'.



Note that you are not concerned with the detailed map on the internal sides of the leaflet.

(6 marks)

The use of colour is expected.

(22 marks total)

End of examination paper