MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
MAY 2015

SUBJECT:	ENGINEERING DRAWING/GRAPHICAL COMMUNICATION
PAPER NUMBER:	I
DATE:	6th May 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.

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 cantilever pin-jointed frame is attached to a wall and loaded as shown in Figure 1.

a) Using a scale of 10mm representing 0.5m, copy the space diagram.
b) Label the frame using Bow's notation.
c) Determine graphically the:
    i)   magnitude, direction and sense of the reactions exerted by the wall at the top and bottom joint.
    ii) magnitude of the forces in the members EM, FM, ML, LK, KF and KJ.
d) Show on the space diagram, by use of arrows, which members are in compression and which members are in tension.
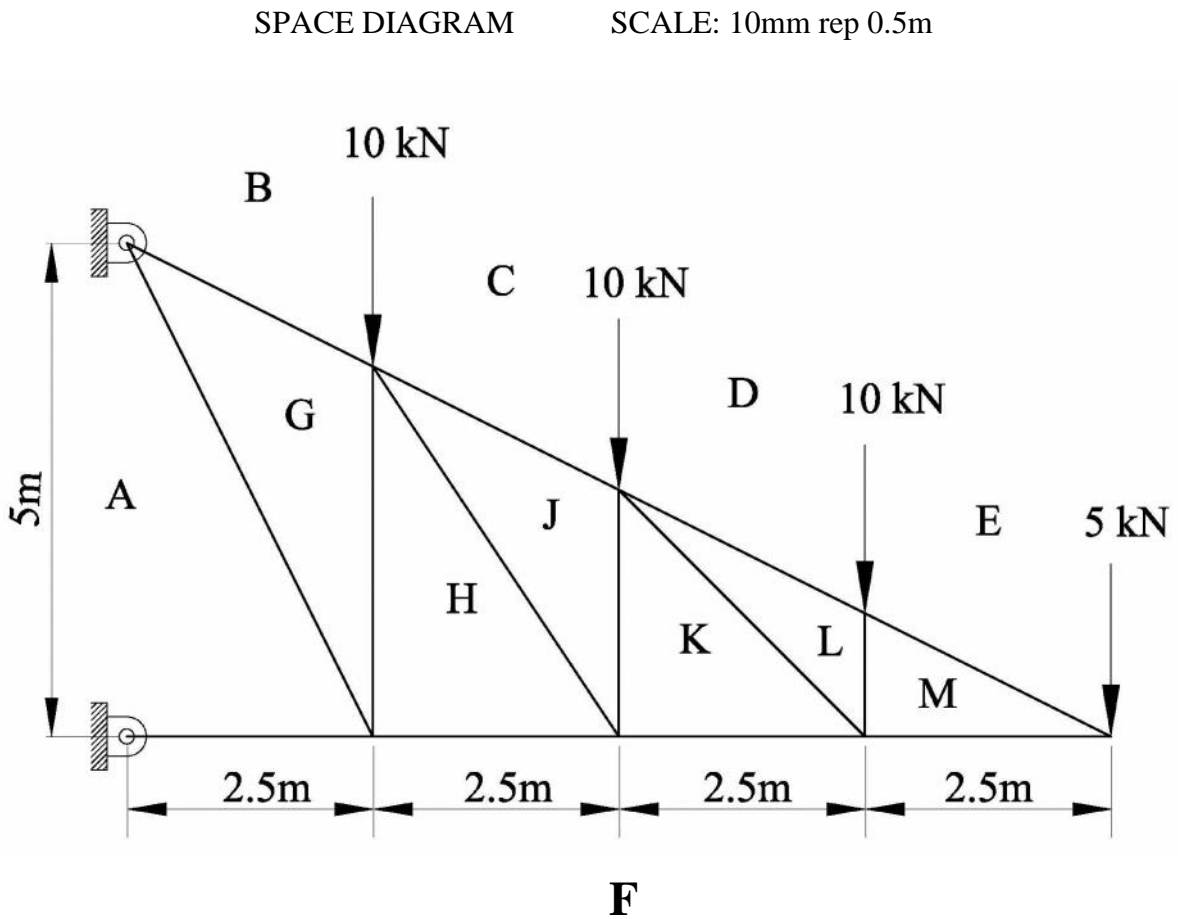
(20 marks)

SPACE DIAGRAM   SCALE: 10mm rep 0.5m

Figure 1

Question 2

A distance piece consists of a conical solid with a square hole machined through its centre (Figure 2a).

The elevation and plan of the distance piece and the traces of an oblique cutting plane are shown in Figure 2b.

Draw, full size, the following views of the distance piece with the part above the cutting plane removed.

a) Auxiliary elevation of the distance piece with the traces being represented by a straight line;

b) Front elevation;
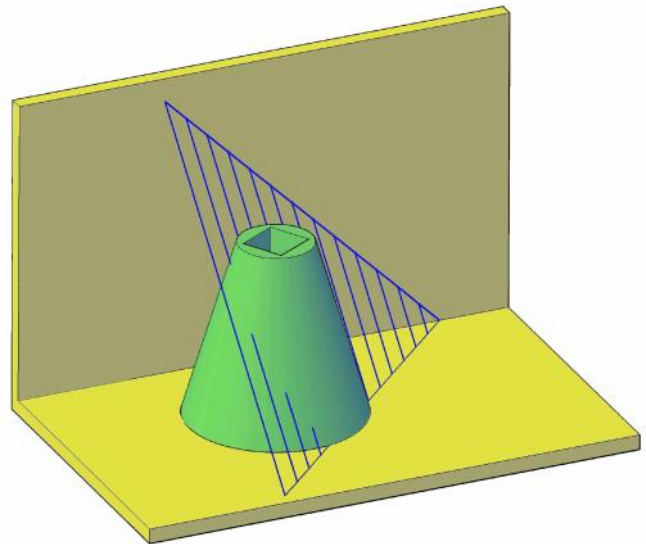
c) Plan;

d) True shape of the cutting plane surface.
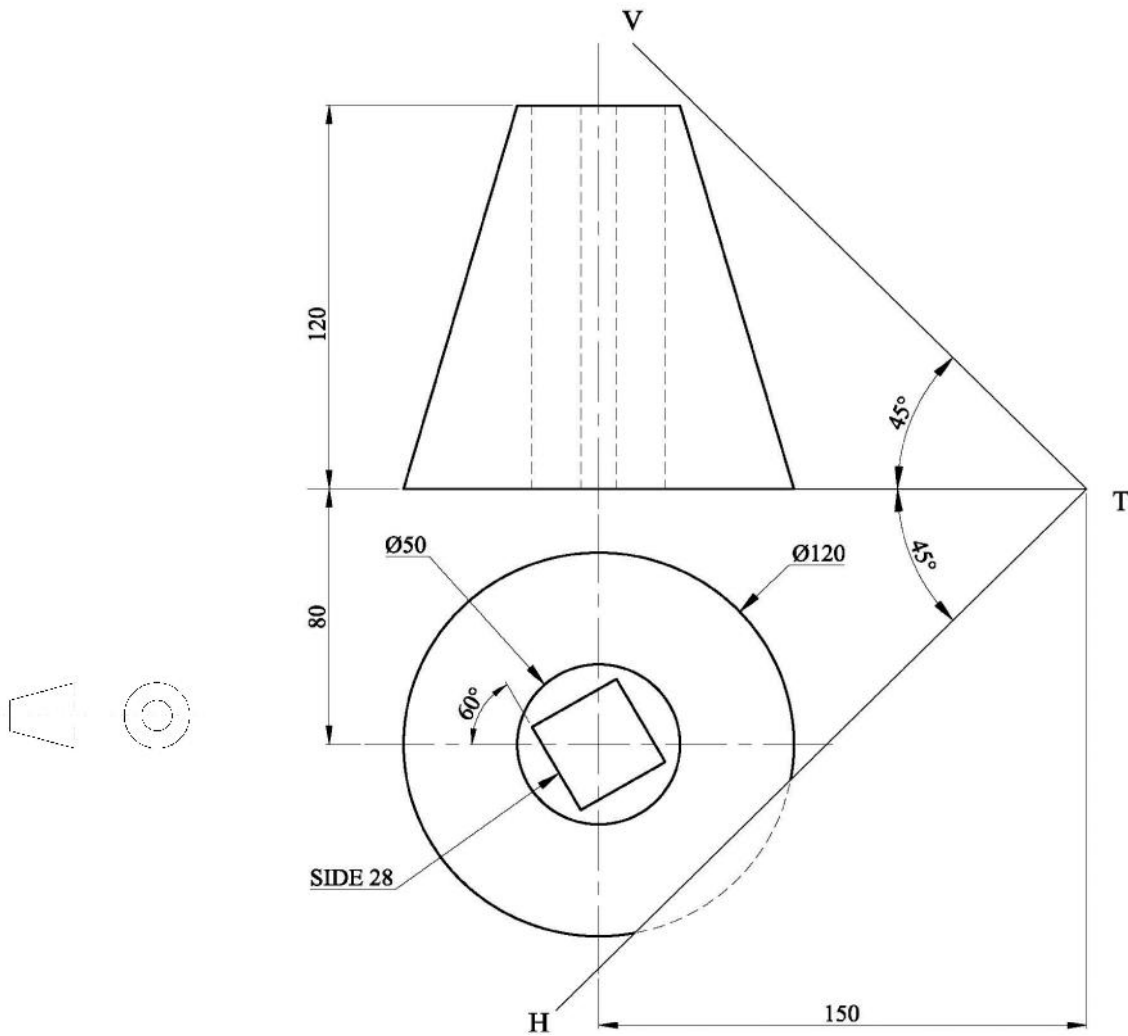
Figure 2a

(20 marks)

Figure 2b

Question 3

A carpenter designed a handle for a box sliding lid (Figure 3a), using three curves A, B and C as shown in Figure 3b. The three curves are generated by the locus of point P and point Q. Draw, using the dimensions shown in Figure 3c.
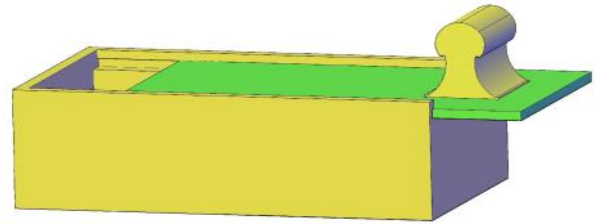
a) The curve A, which is the locus of the point P lying outside the generating circle which is rolling clockwise for one revolution on the outside of the base directing circle.

b) The curve C, which is the locus of point Q lying outside the generating circle which is rolling anti clockwise for half a revolution on the inside of the base directing circle.
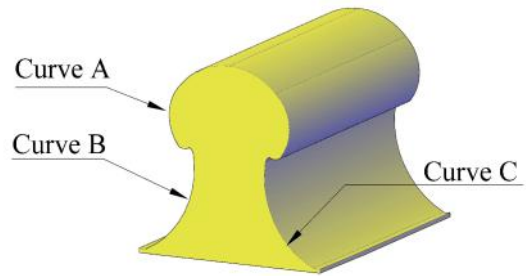
c) The curve B which is a reflection of curve C.

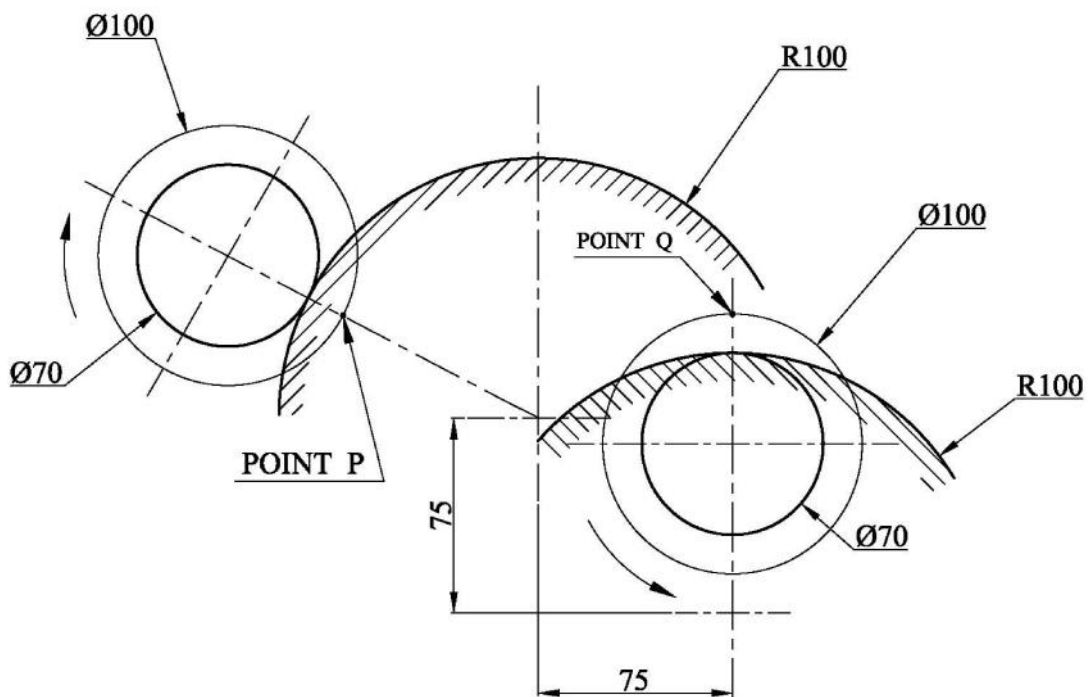**Figure 3a**

Figure 3b

(20 marks)

Figure 3c

Question 4

The essential details of a plate cam are shown in Figures 4a and 4b. The figures show the cam follower offset to the centre of the plate cam. The cam follower is presented on its initial position at the lowest displacement. The cam rotates anticlockwise at 100 rev/min on a 40mm diameter shaft and imparts the following motion to the follower:

Dwell for 0.075 sec;

Lift of 72mm with simple harmonic motion for 0.125 sec;

Fall of 24mm with uniform velocity for 0.1 sec;

Fall of 48mm with uniform acceleration and retardation for 0.3 sec.

a) Develop the cam displacement diagram and the cam profile to full scale.

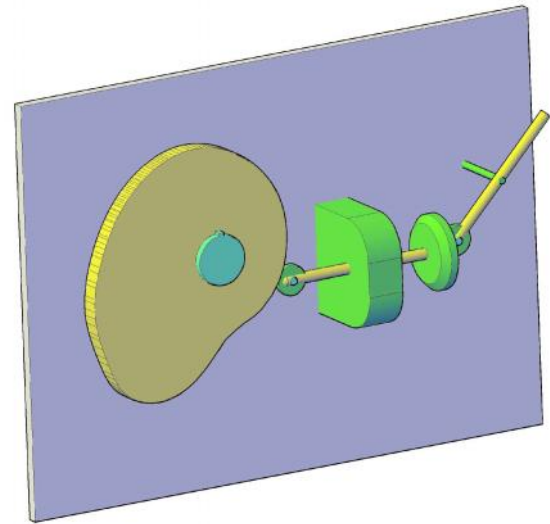b) Draw the position of the mechanism and state the maximum angular movement of the link PQ.
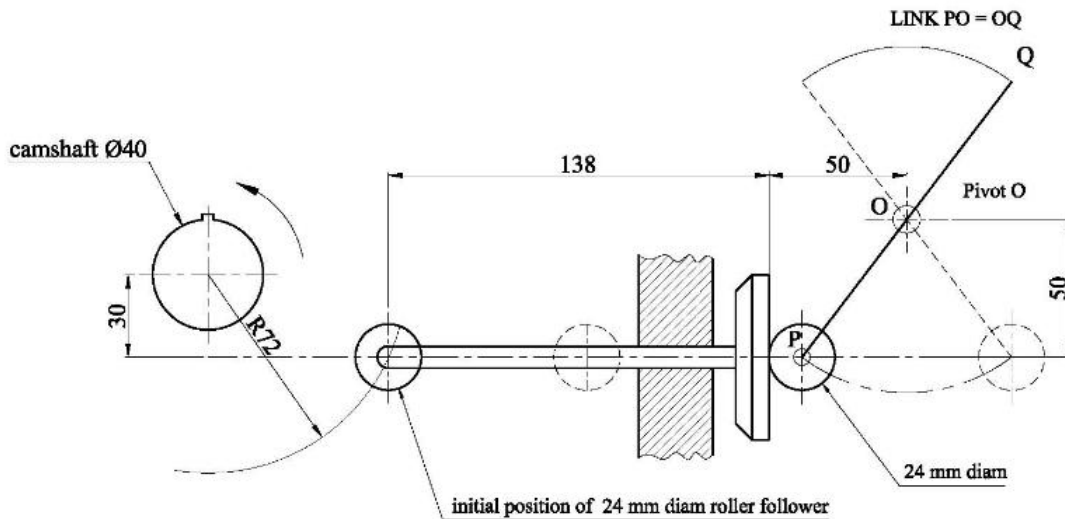

Figure 4a

(**20 marks**)

Figure 4b

Question 5

A conical transition piece is intersected by a right cylinder as shown in Figure 5a. The cylinder axis is perpendicular to the vertical plane and parallel to the horizontal plane.

    a) Copy, full size, the incomplete views shown in Figure 5b.

    b) Draw surface lines on the transition piece as required and present a complete plan, showing the curve of intersection.

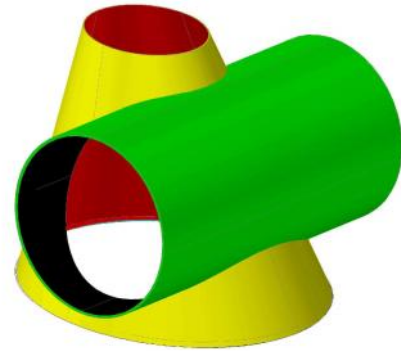   c) Construct a half surface development of the conical transition piece.

      Place the joint line along the line Y-Y. Material thickness is to be ignored.
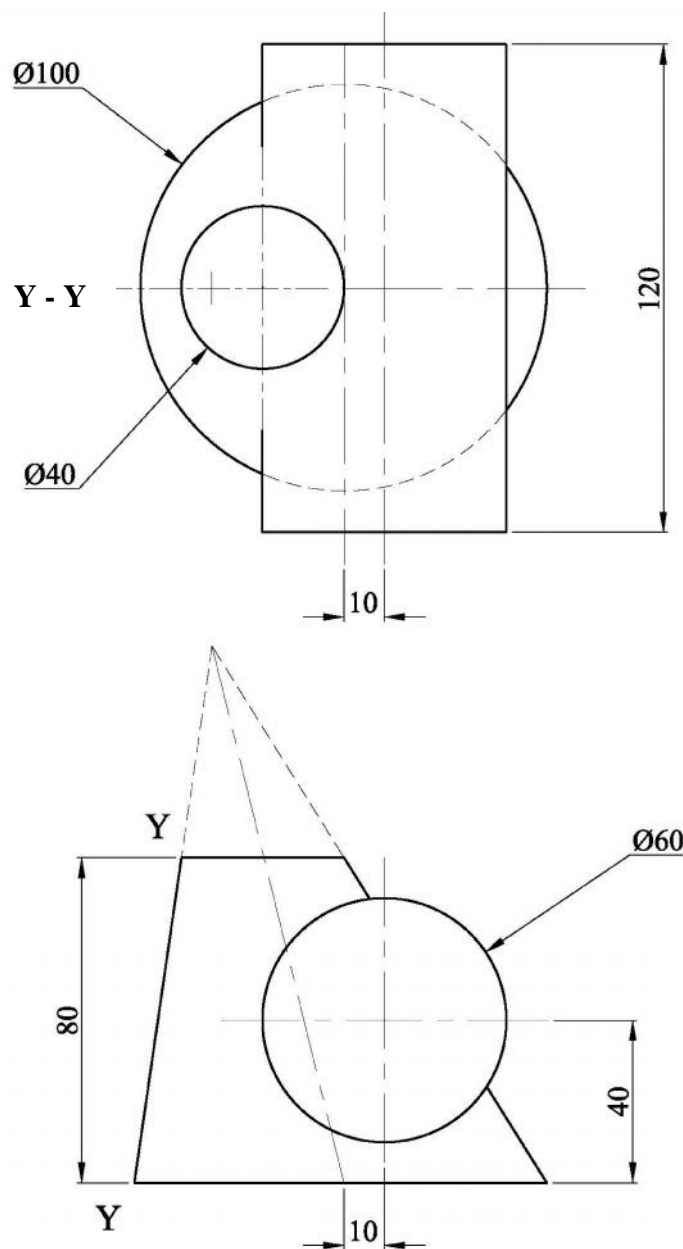
Figure 5a

(20 marks)

Figure 5b

Question 6

An illustration and orthographic views of a pipeline and a sphere are shown in Figures 6a and 6b. The pipe is 12mm diameter and its longitudinal axis is represented by the line **AB**.

C is the centre of the 120mm diameter spherical tank.

a) Copy full size the orthographic views.
b) Connect the centre of sphere C to each end of line **AB** to form a plane **ABC** and draw a first auxiliary elevation showing the plane **ABC** as an edge.
c) Construct a second auxiliary view to show the true shape of plane **ABC** and the clearance, if any, between the pipe and the sphere. Measure and state the clearance.
d) Indicate on the front elevation and plan the shortest distance between line **AB** and the centre of the sphere.
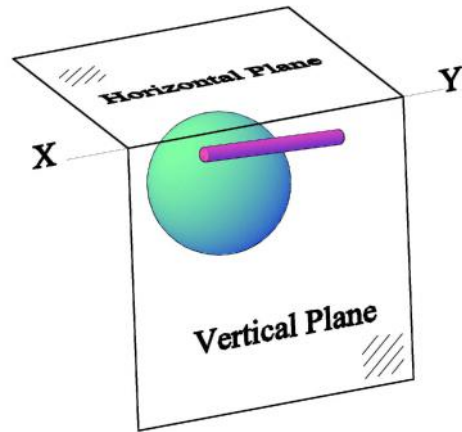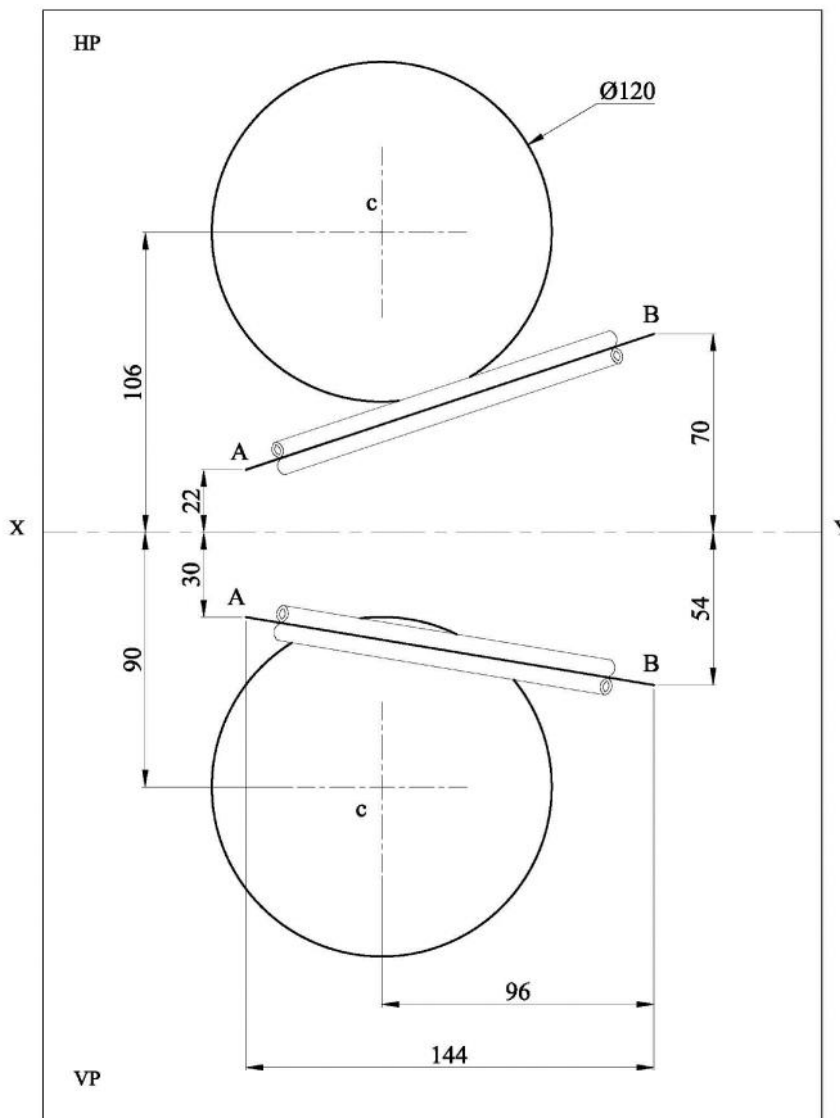
Figure 6a

(20 marks)

Figure 6b

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UNIVERSITY OF MALTA, MSIDA

MATRICULATION EXAMINATION
ADVANCED LEVEL
MAY 2015

SUBJECT:	GRAPHICAL COMMUNICATION
PAPER NUMBER:	II
DATE:	7th May 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.

Attempt **all** questions.

Programmable calculators **cannot** be used.

Unless otherwise stated:

   a. drawings should conform to B.S. or equivalent (ISO) standards;
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   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 (This question is compulsory)

A room corner is to be converted into a home bar area. The front view, the end view and the plan of the proposed bar area are given in Figure 1. The bar furniture consists of a bar cabinet, shelving and four stools. A drop-down ceiling, fitted with lighting fixtures, hangs over the bar area.
The given views constitute an integral part of the design process, but fail to convey a feeling of the **3D** proportions of this room.
You are to meet this requirement by drawing a **two-point estimated perspective drawing** of the room corner. The viewing direction required is indicated by the arrows in the plan view.

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 bar area.
(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 available space.
(25 marks)

iii)   Enhance your answer graphically using colours, tone and texture.
(6 marks)

You are expected to apply colour/tone/texture to small areas of each different item appearing in your illustration.
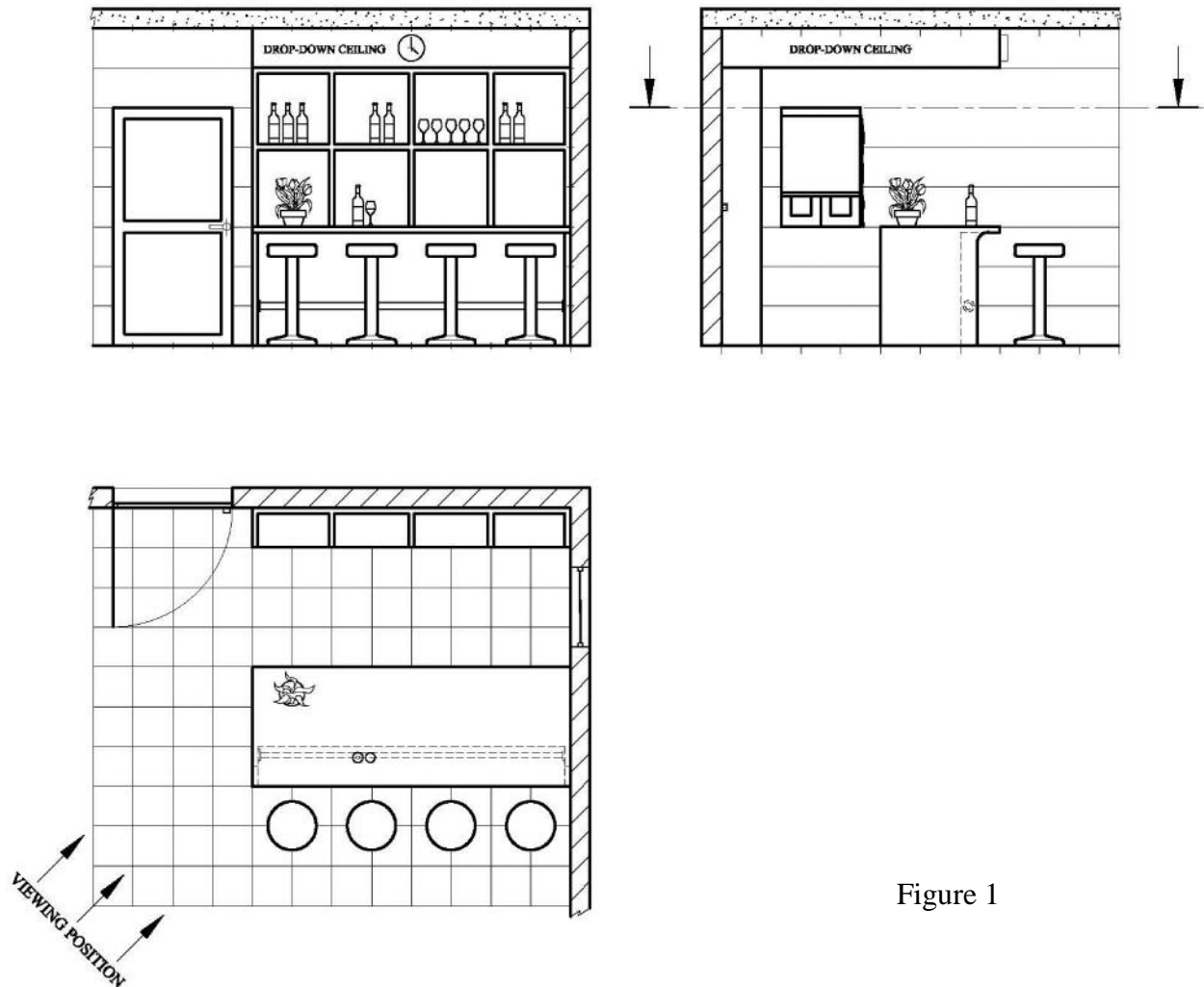
(34 marks total)

Figure 1

Question 2

Gyms and fitness centres are becoming very popular particularly among the weight and diet conscious people.

The management of a new fitness centre *Slim Gym* launched a logo design competition to market their company. The following is their design brief:

We need the logo to appeal to both women and men aged between 20-35.The images/graphic symbols chosen should be appropriate for the fitness business. The colours need to be bright and energetic and the typeface selected is to be bold, stylish and clearly legible.

The selected logo will be used on the Web and printed on magazines, tee-shirts and billboards.

If you are interested in taking part in this competition you are to submit your work and break it down in the steps given below and as shown in Figure 2.

a) **Written analysis**

   Identify, using keywords/short phrases, the main parameters of the brief.   **(2 marks)**

b) **Graphical analysis**

   Based on your response to (a), produce a series of preparatory sketches that illustrate your developing ideas.   **(4 marks)**

c) **Graphical synthesis**

   Clearly identify those elements produced in your sketches that you intend to use in the final image.   **(2 marks)**

d) **Final realisation**

   Produce your final solution in a rectangle of suitable format.   **(14 marks)**

(22 marks total)

Figure 2

Question 3

A recent research study about childhood obesity has demonstrated the following facts:

  i.   One in three children is considered overweight or obese.

 ii.   Two out of three children do not get daily physical activity.

iii.   The daily average time children spend in front of TV or computer screens is five hours.

 iv.   50% of overweight children remain overweight as adults.

Your task is to represent the above information by means of an infographic chart.

The layout of your chart should include:
a) The title CHILDHOOD OBESITY written in an appropriate font.   **(2 marks)**
b) A suitable coloured visual representation of each fact listed above.   **(5 marks each)**

Note: An example of an infographic chart is given in Figure 3.
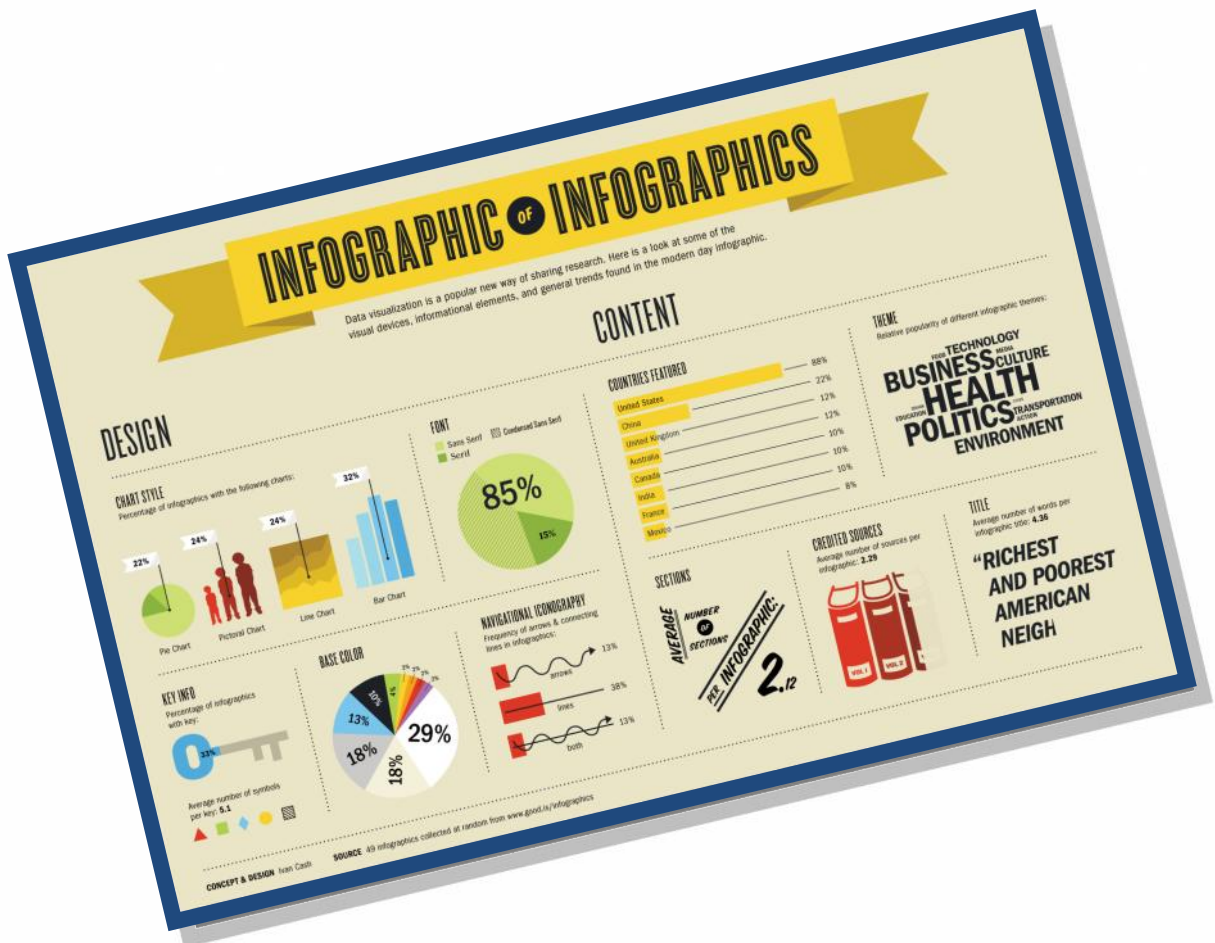
(22 marks total)

Figure 3

Question 4

A birdhouse is made up of seven prefabricated wooden panels as shown in Figure 4. Visual instructions are required to explain how these panels are to be assembled.

You are requested to:

a) produce a freehand exploded drawing to specify the order of assembly of the **base**, the **front** panel and the **back** panel;   **(8 marks)**

b) make a well-proportioned freehand pictorial drawing of the completely assembled birdhouse;   **(10 marks)**

c) render the assembly drawing to represent the wooden texture of the birdhouse.
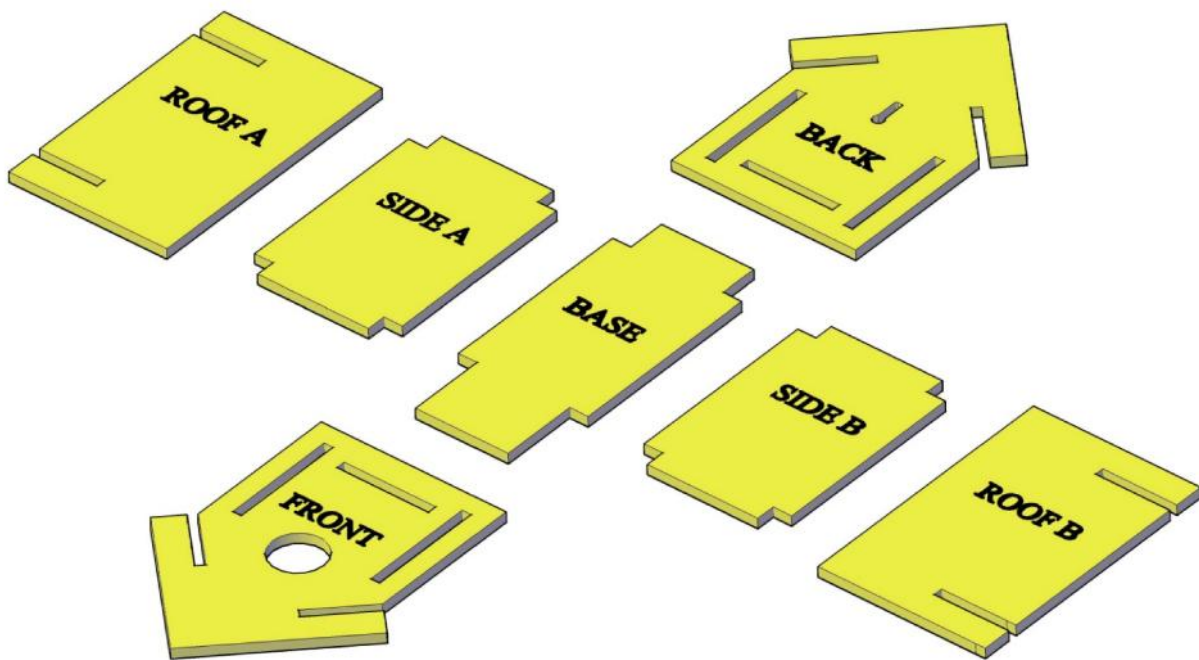   **(4 marks)**

                    (22 marks total)

Figure 4

End of examination paper