



SUBJECT:	Engineering Drawing/Graphical Communication
PAPER NUMBER:	I
DATE:	14 th December 2020
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:

- 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 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. A cantilever frame is mounted to a vertical wall as shown in Figure 1. The framework is kept in position by a horizontal reaction at the top left-hand corner R_1 and a reaction R_2 at the bottom left-hand corner of the framework. The cantilever supports three loads.
 - a) Copy the space diagram. Adopt the suggested scale and label the spaces of the framework using Bow's notation. (3)
 - b) Draw the complete stress diagram for all the members of the given cantilever. Use a scale of 30 mm representing 1 kN. (5)
 - c) Determine graphically the magnitude of the **TWO** reactions. Also determine the direction of R_2 . State your results. (4)
 - d) Tabulate the various member forces, stating the magnitude of each member and whether the members are 'struts', 'ties', or 'redundant'. (8)

(Total: 20 marks)

SPACE DIAGRAM SCALE: 15 mm : 1 m

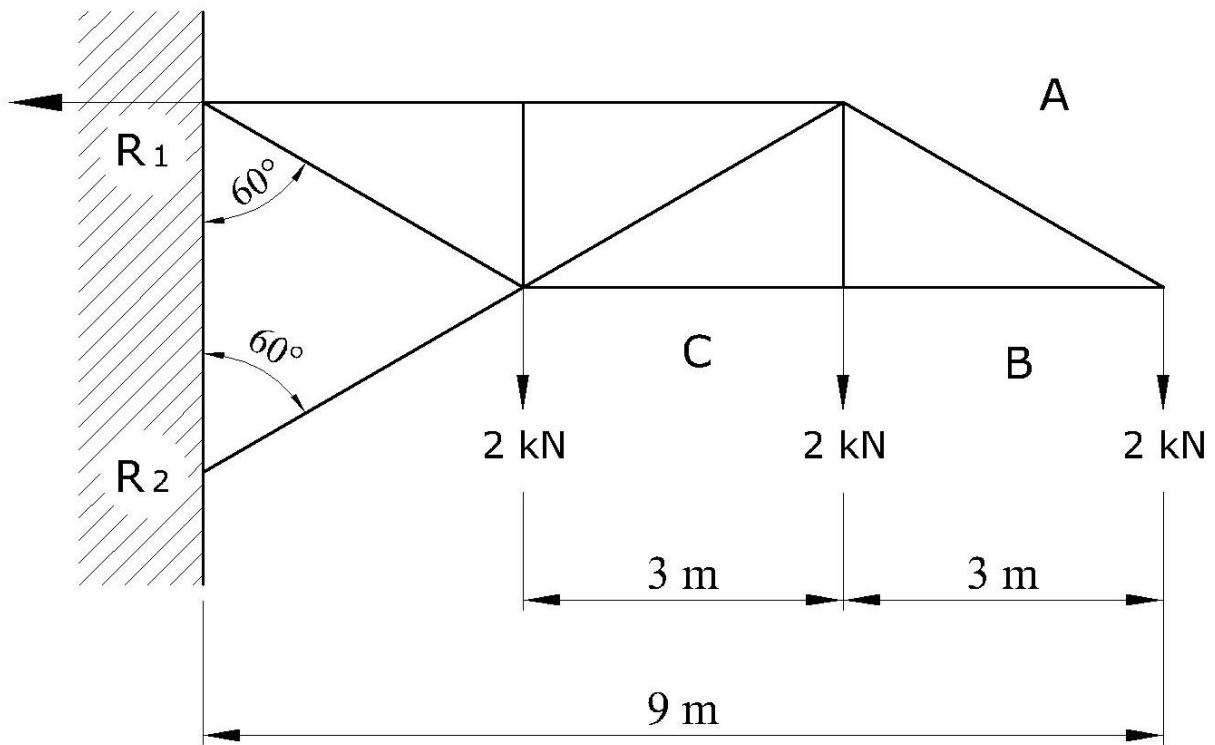


Figure 1

3. A 3-D illustration in Figure 3a and a 2-D drawing in Figure 3b show a mechanism consisting of two cranks, two pivoted links and a sliding link.
- Crank CD rotates clockwise about centre C.
 - Crank CD rotates **twice** for every revolution of crank AB.
 - Crank AB rotates anti-clockwise about centre A.
 - B, D and E are pivot joints.
 - S is a sliding link which slides along XY.

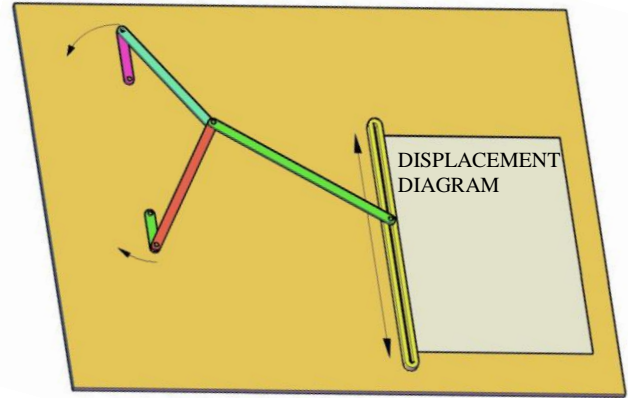


Figure 3a

You are requested to:

- copy the given views; (4)
- plot the locus of pivot E for one revolution of crank AB; (10)
- draw the displacement diagram for sliding pivot S. (6)

(Total: 20 marks)

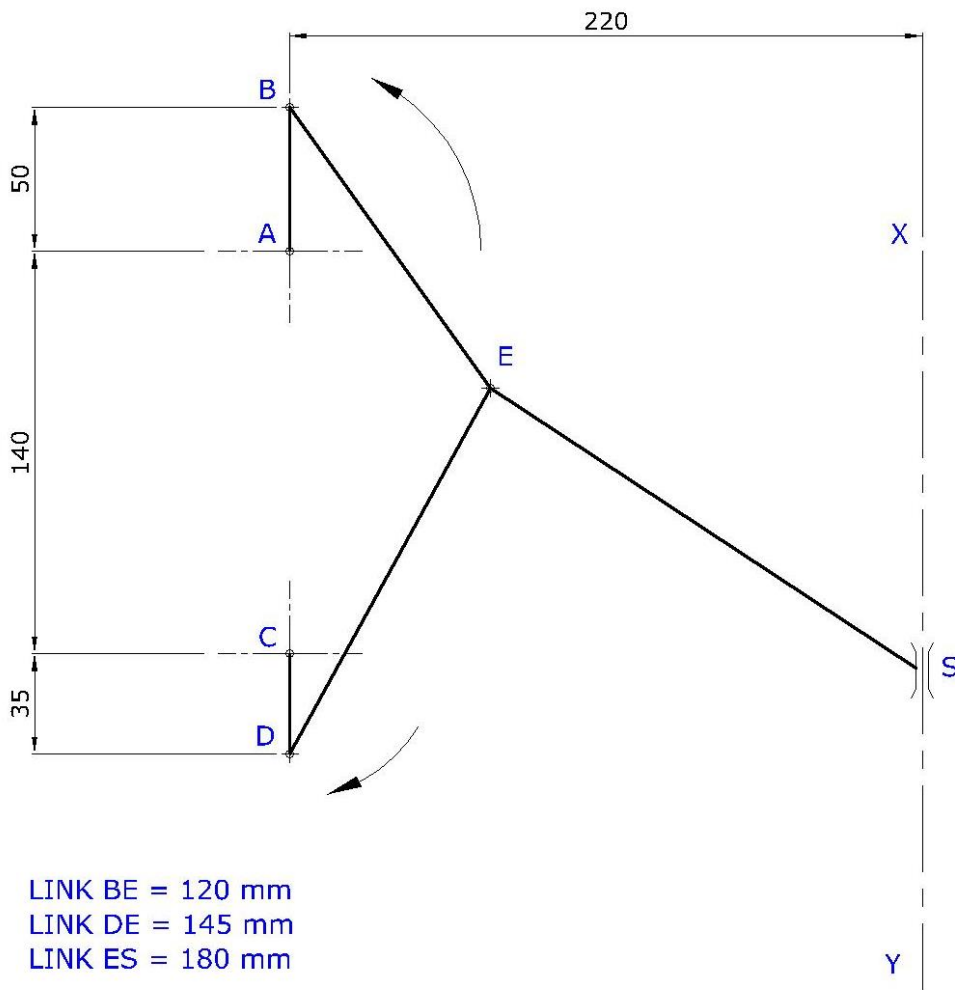


Figure 3b

4. A fitness campaign logo is shown in Figure 4a. The logo is made up of a pair of hyperbolas and two parabolas as shown in Figure 4b.

You are requested to:

- a) draw the transverse and conjugate axis of the hyperbolas; (1)
- b) draw the auxiliary circle and locate V1, F1, V2 and F2; (1)
- c) construct the hyperbola on the right; (6)
- d) reflect the hyperbola on the left; (2)
- e) locate, by construction, the asymptotes and directrix (the asymptotes determine the thickness of the hands and feet); (1)
- f) state the ratio of eccentricity of the hyperbola; (1)
- g) construct a normal to the right hyperbola (where indicated) to locate and draw the $\varnothing 50$ circular head; (2)
- h) using the rectangle method, construct the lower parabola touching points U, V and W; (4)
- i) reflect the upper parabola. (2)



Figure 4a

(Total: 20 marks)

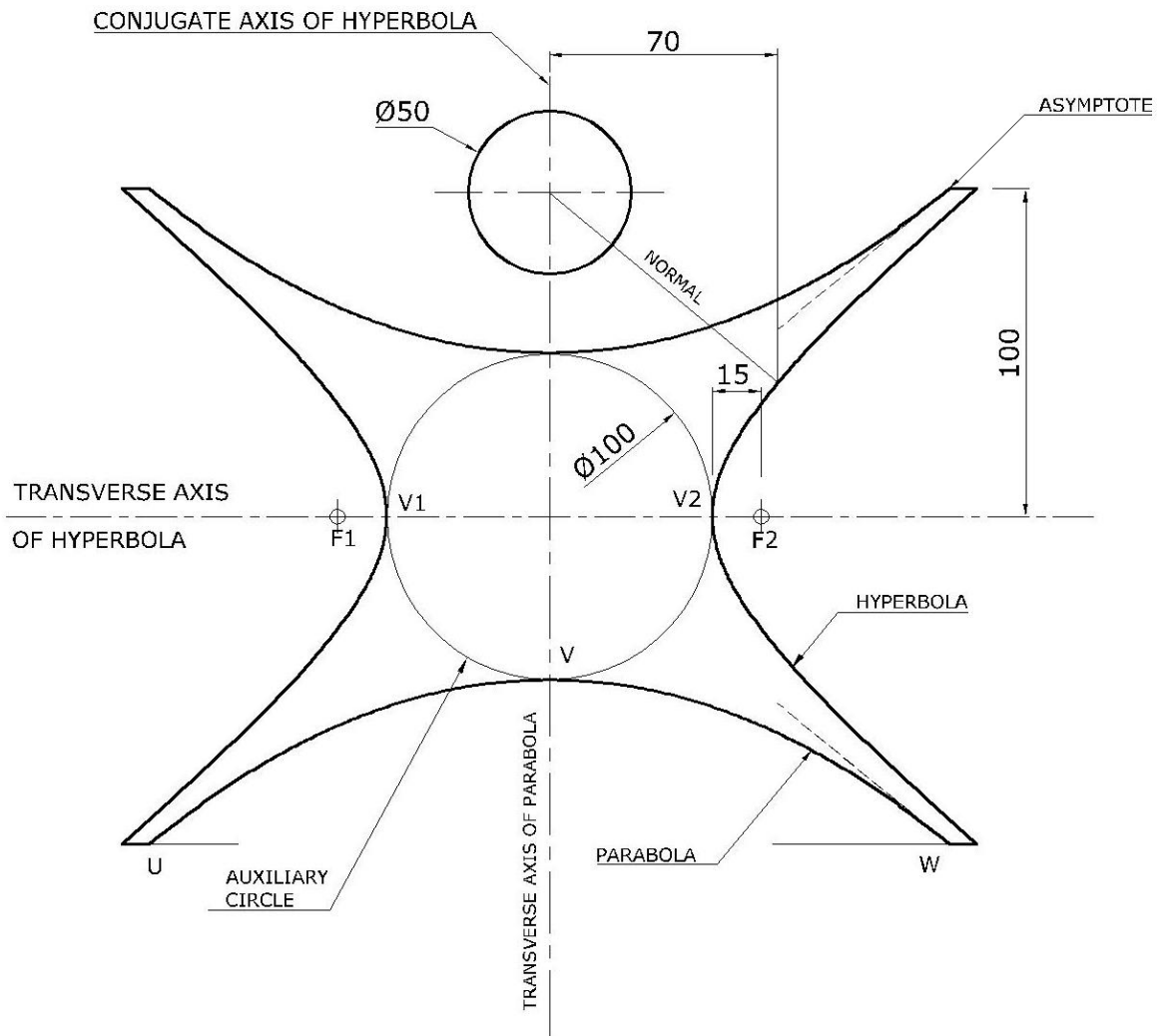


Figure 4b

5. An illustration of a bracket with a machined hexagonal hole is given in Figure 5a. Two orthographic views of the bracket are given in Figure 5b. You are required to:
- copy the given orthographic views; (6)
 - project an auxiliary view of the bracket to determine the true angle that the slope makes with the horizontal plane; (5)
 - state the true angle; (1)
 - project a second auxiliary view of the complete bracket to determine the true shape of the sloping face. (8)

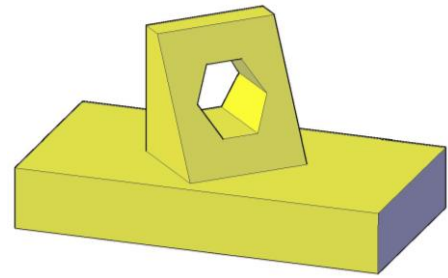


Figure 5a

(Total: 20 marks)

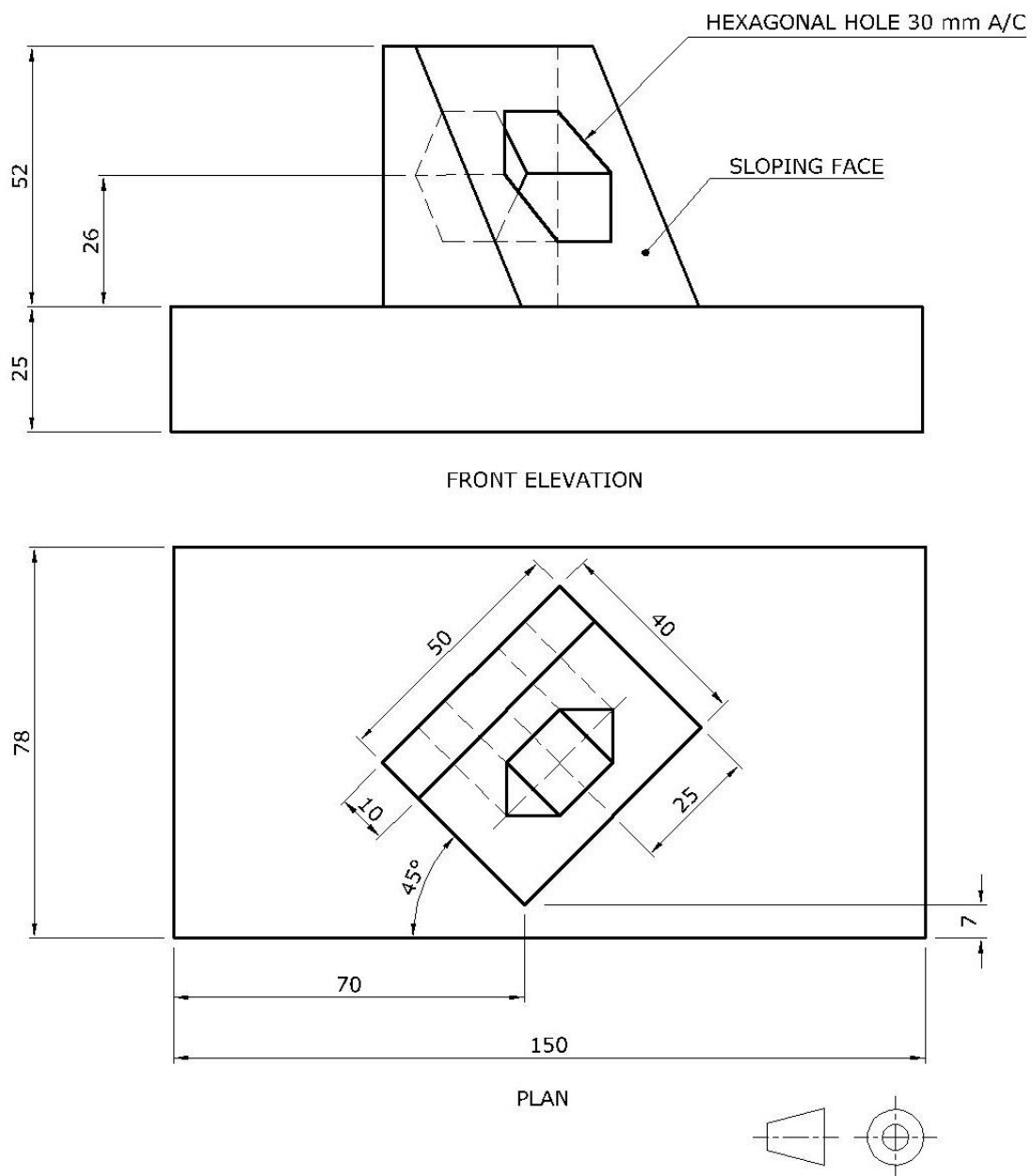


Figure 5b

6. The 'Y' piece shown in Figure 6a consists of a right cylinder and two truncated oblique cylinders. The 'Y' piece is used to connect three pipes of the same diameter. Figure 6b shows the orthographic views of the right-hand truncated oblique cylinder. You are required to:
- a) copy the given views; (3)
 - b) complete the end elevation; (6)
 - c) project / construct the surface development of the truncated oblique cylinder. (11)

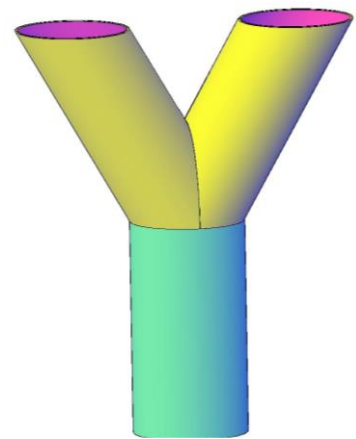


Figure 6a

(Total: 20 marks)

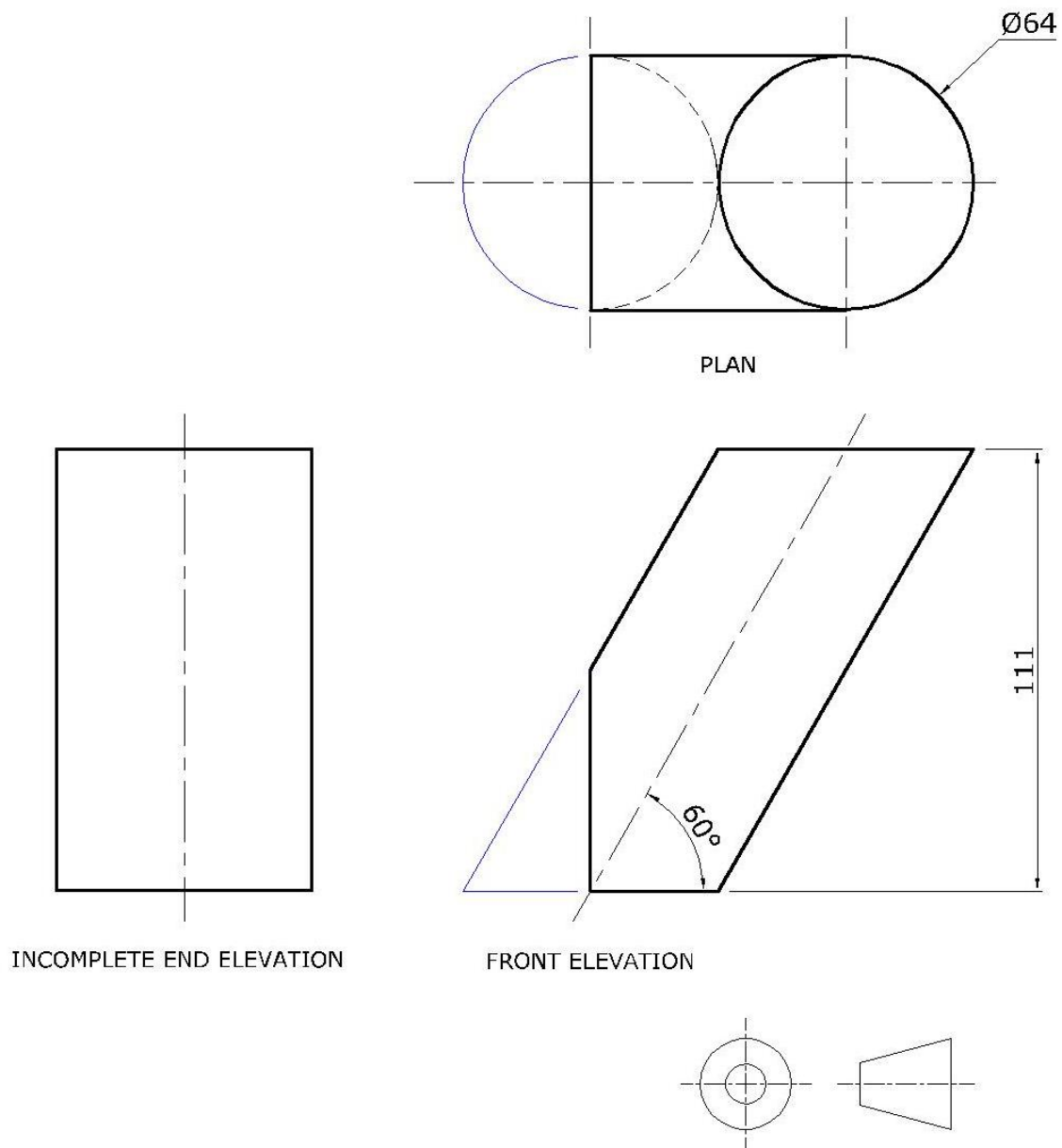


Figure 6b



SUBJECT:	Graphical Communication
PAPER NUMBER:	II
DATE:	15 th December 2020
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 **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. 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. An interior designer has been commissioned to redecorate a bedroom. The designer has submitted five orthographic views of the proposed bedroom as shown in Figure 1. The room contains a double bed with two side cabinets, lampshades, a framed painting above the bed, two wardrobes, one of which having sliding doors, a TV unit cabinet, a carpet, a floor-mounted air conditioner and a clock.

The dimensions of the floor tiles are 25 cm x 25 cm. The height of each course is also 25 cm.

The five orthographic views detail the proportions of each listed item within the entire bedroom area. Use this information to construct a one-point estimated perspective drawing of the entire area to help the owners of the property visualize the drawing plans in 3D. The viewing direction required is indicated by the arrows on the plan view.

- a) 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 room while still giving enough detailed information of the furniture therein. (3)
- b) Based on the choice made in part (a), use a scale of 1:10 to produce the required illustration on a single side of an A2-sized paper. (26)
- c) Enhance your drawing by colouring small areas of the different items appearing in your illustration. (5)

Notes:

- The bedclothes are made of cotton textile.
- The wardrobes, the side cabinets, and the TV cabinet are made of Melamine Faced Chipboard.
- The carpet is made of Nylon fabric.

(Total: 34 marks)

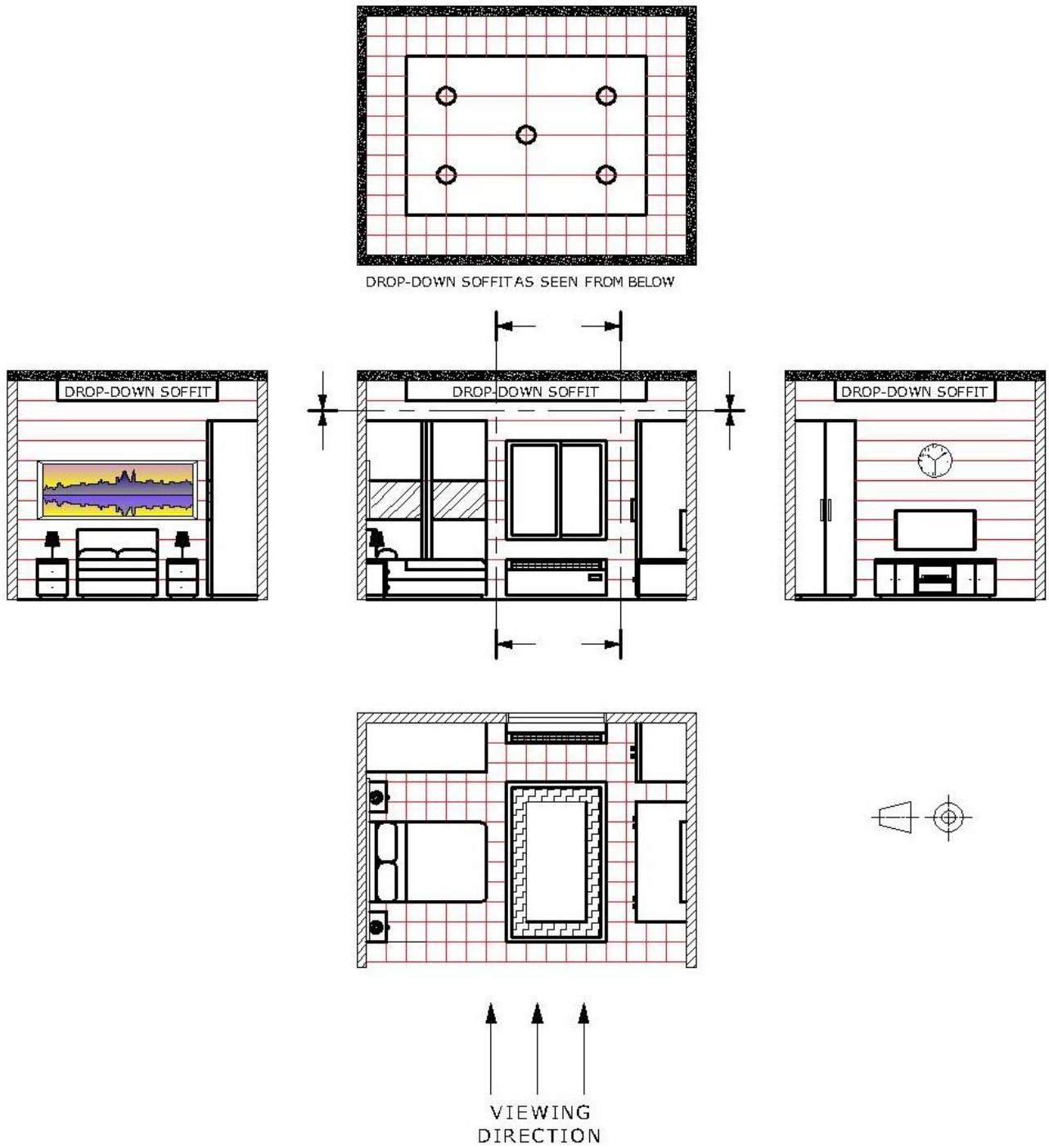


Figure 1

2. Figure 2 shows five orthographic views of a kitchen scales. The main body of this scales is made of stainless steel while the bowl is made of durable plastic.

The bowl fits into a cylindrical attachment that springs in and out of the main body of the scales. The same bowl can be detached from the scales by lifting it upwards.

You are requested to:

- a) make a well-proportioned freehand isometric drawing of the kitchen scales; (12)
- b) colour and shade your drawing, paying attention to the representation of the different materials and textures; (6)
- c) neatly annotate your drawing to indicate the following features:
 - durable plastic bowl; (2)
 - stainless steel body. (2)
- d) draw arrows to illustrate the release of the bowl from the kitchen scales. (2)

(Total: 22 marks)

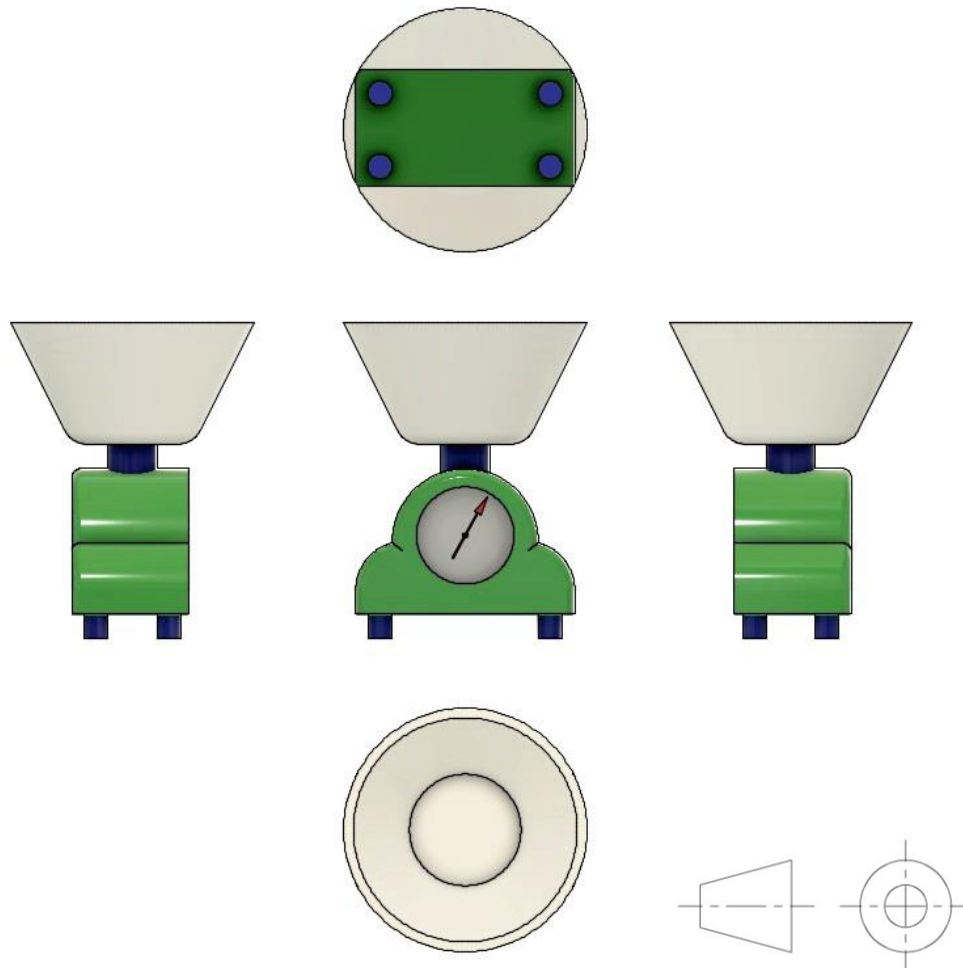


Figure 2

3. During a video-games fair, the organisers ran a questionnaire among its visitors regarding gaming-type preference. The following table was drafted from the gathered data.

Player Age Category	TYPES OF GAMES					
	Action	Adventure	Role-playing	Simulation	Sports	Strategy
10-15	30%	20%	10%	10%	30%	0%
16-20	20%	20%	25%	25%	5%	5%
21-30	25%	25%	30%	10%	0%	10%
31-40	10%	10%	35%	35%	0%	10%
41+	10%	10%	25%	20%	10%	25%

You are required to design an infographic poster to show **all** the above data. The poster should include graphs/charts, and graphic symbols/pictograms to illustrate your data.

The title of the poster should be VIDEO GAME-TYPE PREFERENCE. Suitable typefaces should be used for the title and any other statements you should decide to include in your poster. Preparatory sketches should be made to help you organise your poster and help develop your ideas.

It is advisable to divide your A2 sheet in two sections as shown in Figure 3.

(Total: 22 marks)

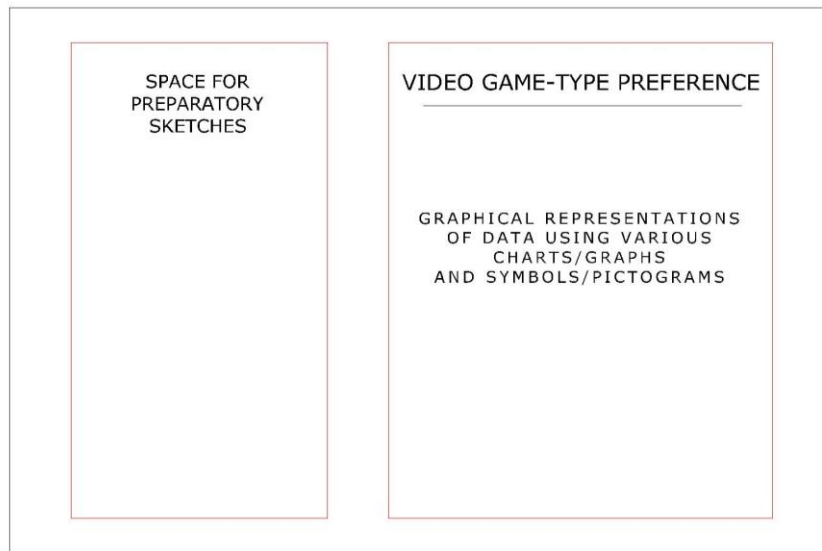


Figure 3

4. A new dentistry clinic by the name of HEALTHY TEETH is opening in town. Its owner, a young dentist, needs an eye-catching sign to place over the entrance to her clinic.

Figure 4a shows a sketch of the entrance to this clinic, indicating where the sign is to be placed.

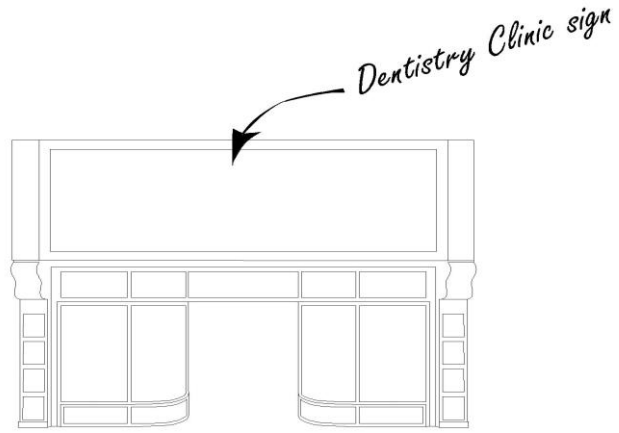


Figure 4a

You have been commissioned to design this dentistry clinic sign which needs to include both graphics and text. You need to present your work broken down according to the following steps and as shown in Figure 4b.

- a) Written analysis
Identify, using keywords/short phrases the main parameters of the design brief. (2)
- b) Graphical analysis
Based on your response to the written analysis, produce a series of preparatory sketches that illustrate your developing ideas. (4)
- c) Graphical synthesis
Clearly identify those elements produced in your sketches that you intend to use in your final design. (2)
- d) Final realisation
Use colour and shading to produce your final realisation in a rectangle as shown in Figure 4b. (14)

Notes:

- Use suitable typefaces for your design.
- Details of the page layout and the clinic sign space are also given in Figure 4b.

(Total: 22 marks)

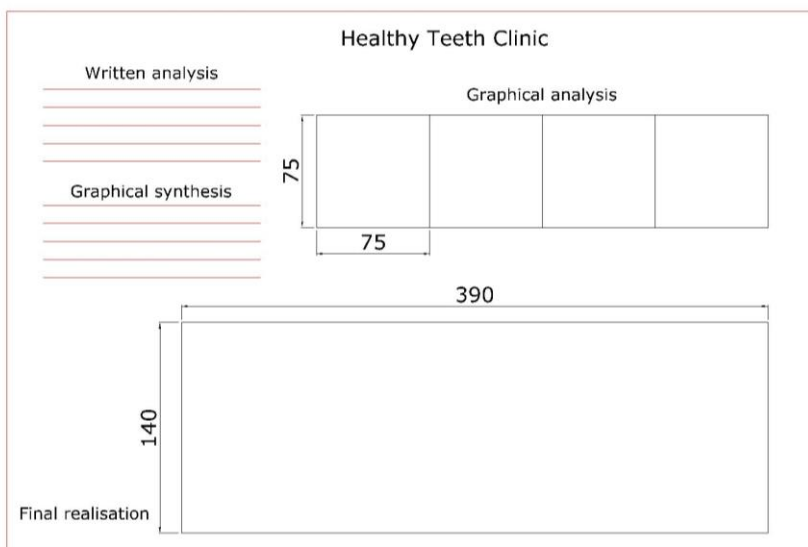


Figure 4b