education

**Department:
Education
REPUBLIC OF SOUTH AFRICA**

NATIONAL
SENIOR CERTIFICATE

GRADE 11

CIVIL TECHNOLOGY

EXEMPLAR 2007

MARKS: 200

TIME: 3 hours

This question paper consists of 13 pages and 2 answer sheets.

**INSTRUCTIONS AND INFORMATION**

1.   This question paper consists of SIX questions.

2.   ALL questions are COMPULSORY.

3.   Answer each question as a whole, do NOT separate subquestions.

4.   Start each question on a NEW page.

5.   Sketches may be used to illustrate your answers.

6.   ALL calculations and written answers must be done in the answer book.

7.   ALL the drawings are to be fully dimensioned and neatly finished off with descriptive titles and notes to conform with the SANS/SABS Recommended Practice for Building Drawing.

8.   For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.

9.   Use your discretion where dimensions and/or details have been omitted.

10.   Non-programmable pocket calculators may be used.

11.   Answer QUESTIONS 6.1 and 6.2 on A3 drawing sheets using drawing instruments.

QUESTION 1

1.1   Bricks can be laid in different bonds. Some of them are laid to show aesthetic
        value, whilst others are laid for their strength.

        1.1.1   Draw freehand, in good proportion, the front elevation of a wall in
                  English bond, THREE courses high.   (4)

        1.1.2   Draw TWO alternate plan courses of a quoin (right angle) of a one-
                  brick wall built in English bond. Show at least THREE bricks on
                  each corner of the wall.   (8)

1.2   You are a bricklayer on site, and you are required to build the wall referred to
        in QUESTION 1.1:

        1.2.1   What are the ingredients (materials) that will be used for the mixing
                  of mortar?   (3)

        1.2.2   What is the average thickness of mortar between courses?   (1)

        1.2.3   What are the properties of good mortar?   (2)

        1.2.4   Make a neat sketch of TWO types of jointing used on the mortar,
                  when laying face bricks.   (2)

        1.2.5   What is the purpose of mortar?   (1)

        1.2.6   What material is used to reinforce brickwork?   (1)

        1.2.7   What will determine the spacing of the reinforcement between the
                  courses in the wall?   (1)

1.3   You are a bricklayer and you have to set out the walls for a building.

        1.3.1   What will you use to ensure that the bricks are laid level, and the
                  corners meet at the same level?   (1)

        1.3.2   Explain how you would set up, align and secure a wooden door
                  frame into a wall.   (4)

1.4   As work progresses there is a need to provide access and transport materials
        to higher levels. Scaffolding is used for this purpose.

        List TWO safety precautions applicable to scaffolding.   (2)

                                                                                          [30]

QUESTION 2

2.1   Formwork for concrete may be described as a mould or box into which wet
        concrete can be poured and compacted so that it will flow and finally set to
        the profile of the box or mould.

        2.1.1   To make formwork economically viable, it must meet certain
                  standards. List FIVE properties that good formwork should meet.   (5)

        2.1.2   Any material specified for use as reinforcement for concrete must
                  meet certain requirements. List FIVE requirements that good
                  reinforcement should meet.   (5)

2.2   Make a neat freehand sketch, in good proportion, of a horizontal section
        through a square reinforced concrete column using the following criteria:

        •   The size of the column is 400 mm x 400 mm.
        •   Four main reinforcing bars with a diameter of 20 mm.
        •   Show ONE binder with a diameter of 6 mm to tie the main reinforcing
                bars.

        Label your sketch.   (3)

2.3   What is the purpose of the grooves indicated in the head and top rail of the
        casement window shown in the figure below?
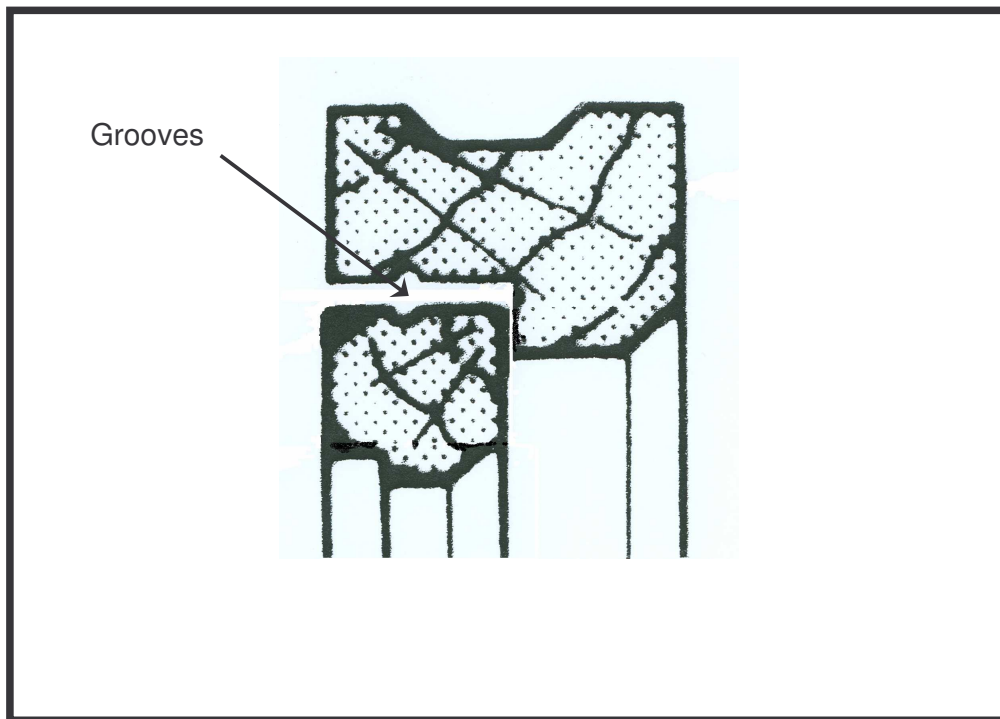
                                                                                       (1)

2.4 The drawing below shows the external elevation of an outward opening casement within a frame. Write the names of the parts next to the letters A, B, C, D, E and F.
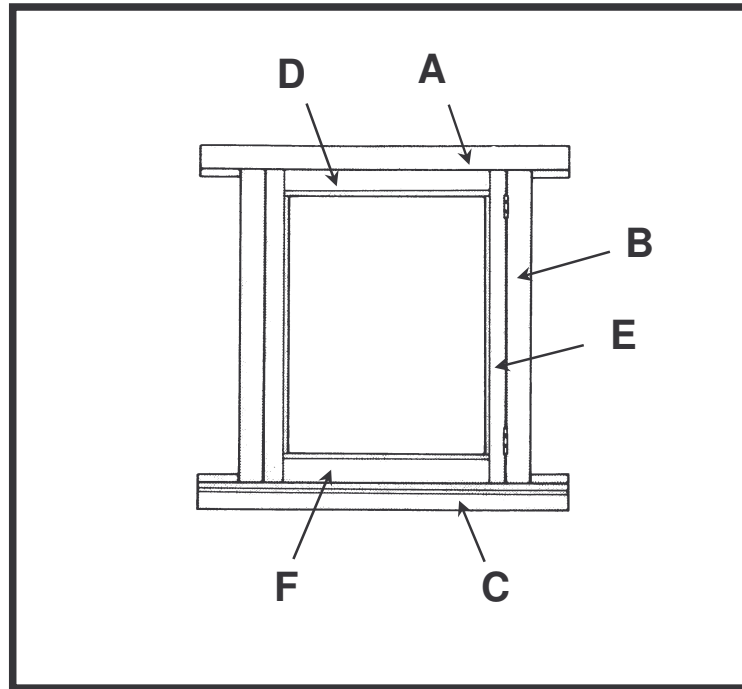
(6)

2.5 A door is a movable barrier that is usually attached to a frame by means of hinges. Doors hung at the entrance are referred to as solid doors and those internally as hollow-core doors.

2.5.1 Draw a table to compare the parts that are specific to a solid door and a hollow-core door. (List at least THREE parts on each side of the table.) (6)

2.5.2 Give TWO features of a solid door. (2)

2.5.3 Give TWO features of a hollow core door. (2)

2.6 State FOUR advantages that the use of screws have over nails. (4)

2.7 State TWO advantages a multiple dovetail joint has over other types of joints, when used for drawers. (2)

2.8 Plywood is used extensively in the building industry. Briefly describe the composition of plywood. (4)

[40]

QUESTION 3

3.1   The sketch below shows the layout of the discharge of wastewater and sewerage from a house to a public sewer. Study the sketch and answer the following questions:
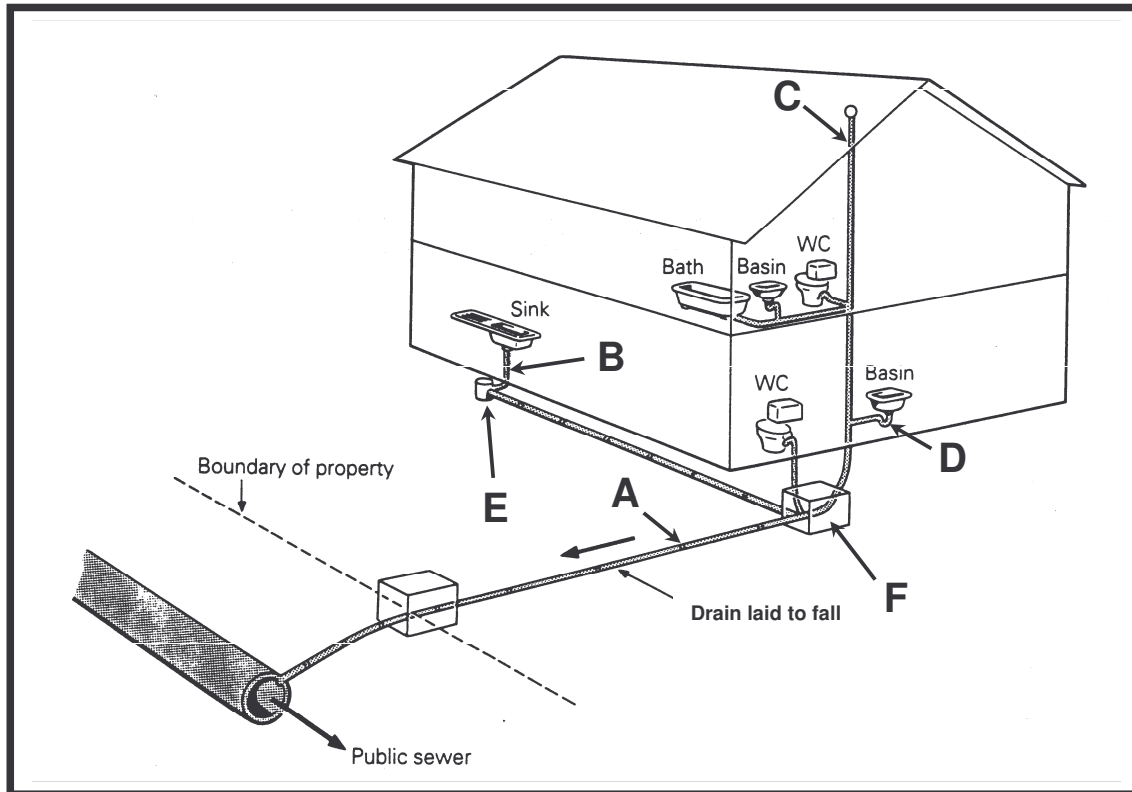
3.1.1   What should the diameter of pipe A be?   (1)

3.1.2   What should the diameter of pipe B be?   (1)

3.1.3   What is the purpose of C?   (1)

3.1.4   What is the purpose of D?   (1)

3.1.5   Identify part E.   (1)

3.1.6   What is the purpose of F?   (1)

3.1.7   What is the recommended gradient for A?   (1)

3.2   The figure below shows two plumbing fittings.

A   **B**
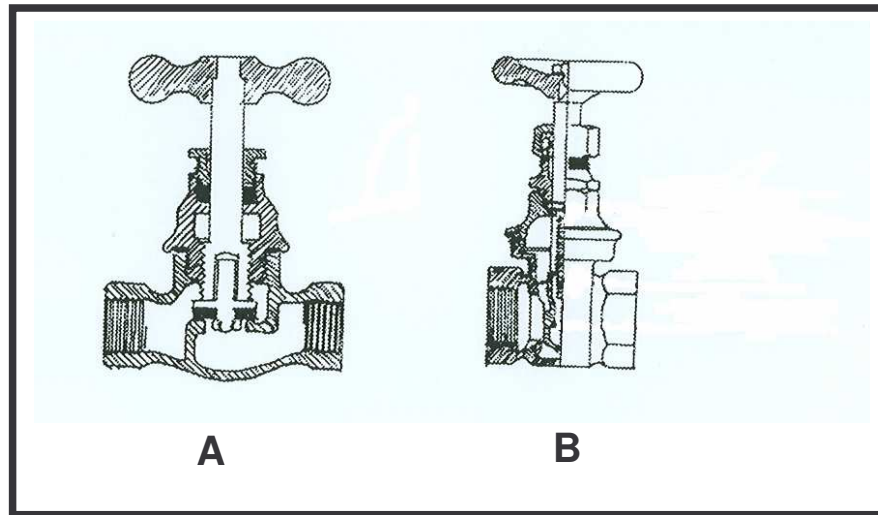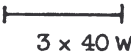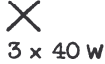
3.2.1   Identify fittings A and B after comparing the composition of the
          TWO drawings above.   (2)

3.2.2   Where would fittings A and B be used in the water supply system?   (2)

3.2.3   What are the causes of a water hammer in a hot-water system?   (3)

3.2.4   When building plans are drawn symbols are used to indicate
          different plumbing fitments. What do the following symbols indicate:

          (a)   G
          (b)   IE
          (c)   MH
          (d)   S
          (e)   SP   (5)

3.3 As a draughtsman you are required to design a house and indicate the correct electrical symbols for electrical fixtures. By referring to the symbol sheet below, insert the appropriate symbols using the SANS (SABS) approved code on the attached answer sheet.

The following must be indicated on the answer sheet provided:

- A light and light switch in every room
- Four plug points must be fitted into the house
- The position of the meter box
- The position of the distribution box (8)

1	2	3	4
Description	Symbol	Description	Symbol
POWER		LIGHTING	
Distribution board		Emergency light	
Earth		Fluorescent light (3 tubes of 40 w)	3 x 40 w
Electricity meter (Watt-meter recording)	W	Light (3 lamps of 40 w)	3 x 40 w
One-way switch single pole		Light wall-mounted	
One-way switch double pole		COMMUNICATIONS	
One-way switch three pole		Telephone, internal	
Two-way switch		Telephone, public	
Regulating switch, for example dimmer			
Socket outlet			
Switched socket outlet			

3.4   Apart from being a qualified electrician, what other formal qualification must
        an electrician have to be authorised to wire a house?   (1)

3.5   What is the purpose of the earth leakage unit in a distribution box?   (2)
                                                                                                [30]
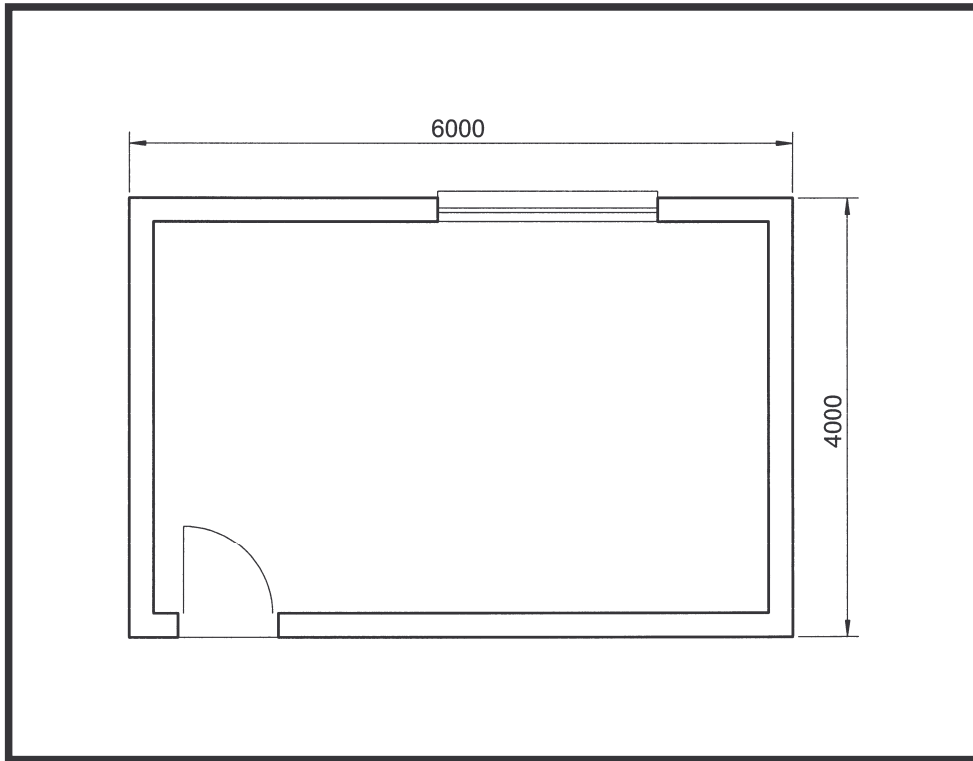
QUESTION 4

4.1   Metals are widely used in the building industry. COLUMN A represents a few
        types of metals, and COLUMN B a few applications (ferrous and non-ferrous).
        Choose a use from COLUMN B to match each metal in COLUMN A. Write
        only the letter (A - F) next to the question number (4.1.1 - 4.1.5) in the answer
        book.

COLUMN A	COLUMN B	
4.1.1 Lead	A	galvanising
4.1.2 Zinc	B	solder
4.1.3 Copper	C	electrical wiring
4.1.4 High-carbon steel	D	baths
4.1.5 Cast iron	E	reinforcement
	F	door handle

                                                                                                (5)

4.2   Glass is widely used in the building industry. Briefly describe the production
        of clear sheet glass used for glazing.   (4)

4.3   Plastics, which are commonly used to manufacture household fittings, can be
        divided into two main groups. Name these TWO groups and list an important
        property of each.   (4)

4.4   You are a quantity surveyor, and it is your duty to calculate the quantities of
        the materials required for the building illustrated in the plan below. Study the
        plan, read the specifications and answer the question that follow on the
        attached ANSWER SHEET:

        Use the following specifications:

        •   The walls is 220 mm thick and built in stretcher bond

        •   The height of the superstructure is 2 600 mm

        •   The thickness of the plaster is 12 mm

        •   The door openings are 2 100 mm high and 900 mm wide

        •   The window openings are 1 200 mm high and 2 000 mm wide

   •   50 bricks are required to build a 1 m² half-brick wall (110 mm)

Determine the number of bricks for the superstructure (ignore the beam filling). (17)

[30]

QUESTION 5

5.1   A beam above a garage door is loaded as shown in the figure below. Do the necessary calculations to determine the shear forces at A, B, C, D and E. Draw the shear force diagram for the beam. Ignore the weight of the beam.
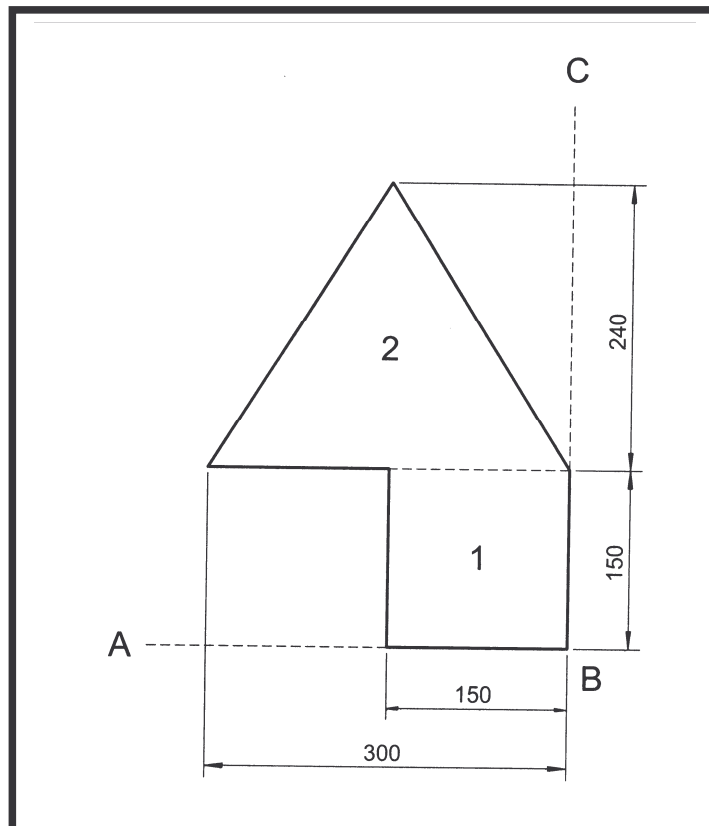
Use a scale of 1 mm = 10 kN.
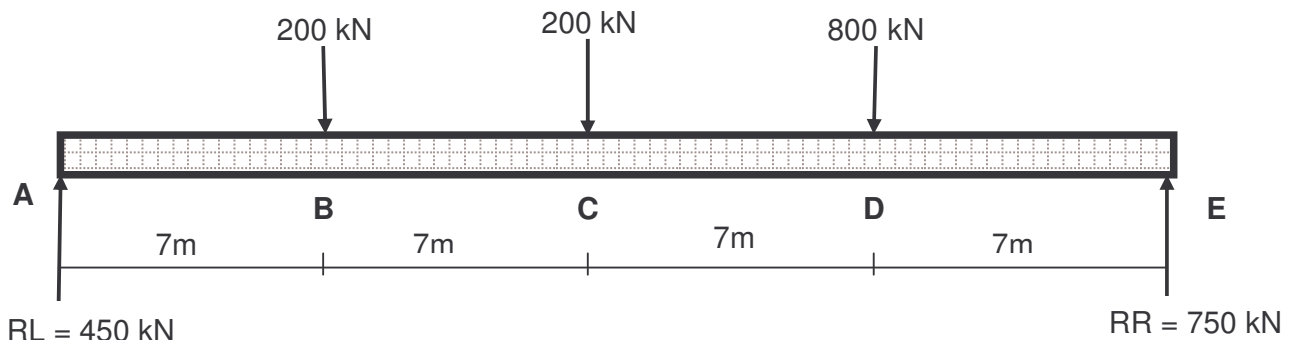
(10)

5.2   The figure below shows forces, which are in equilibrium acting at a point in the same plane. Determine graphically the equilibrant and resultant of the force system. Use the scale 1 mm = 5 N.
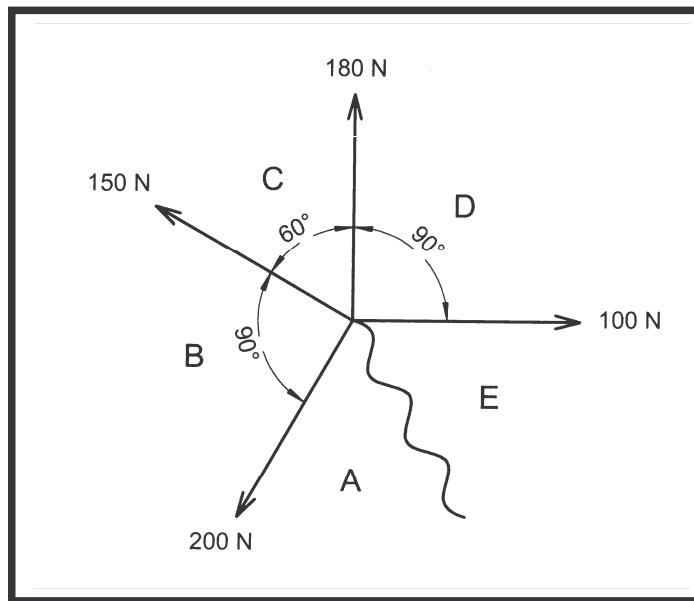
(8)

5.3   Calculate the position of the centroid from line A - B for the figure below. ALL measurements are in millimetres.
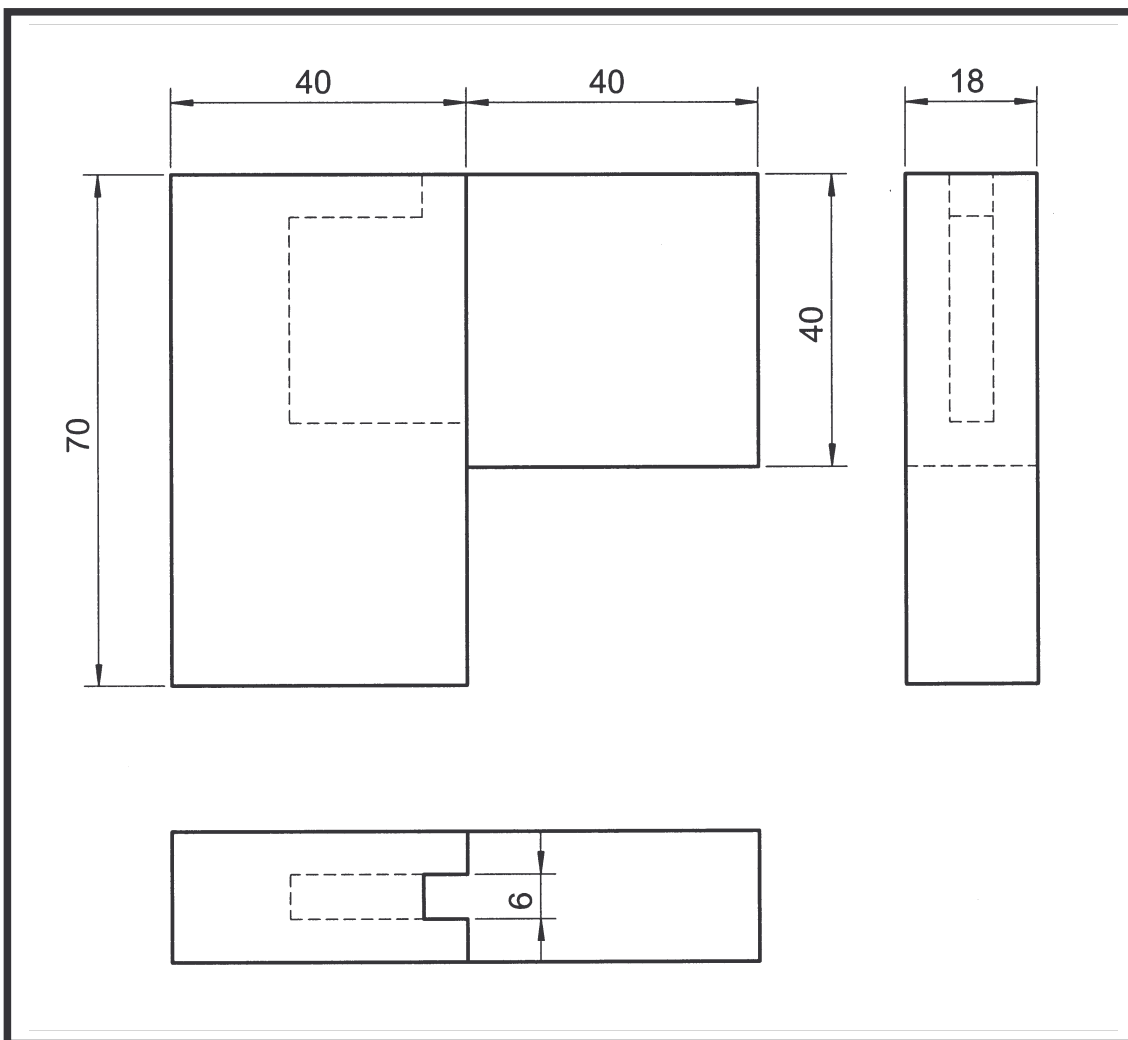

(12)
[30]

QUESTION 6

Answer the following questions on A3 drawing sheets by using drawing instruments.

6.1 The figure below shows the front, top and left view of a haunched mortice and tenon joint in first-angle orthographic projection.

Draw, to scale 1:1, an exploded isometric view of the joint on the ANSWER SHEET provided.

NOTE: NO hidden details are required.

(20)

6.2   The figure below shows provision made for a built-in cupboard in a bedroom.

Design a built-in cupboard to fit into the area. The cupboard must be divided into two sections in the front view. Provision must be made for hanging space on the right hand side and four shelves equally spaced on the left hand side of the cupboard and one shelf above the hanging space. Do not include the doors in your design.

Draw, to scale 1:10, on the A3 answer sheet the following:

*   The front view
*   The sectional left view on cutting plane A - A through the centre of the shelved section of the cupboard
*   Dimension the length, height and depth

The specifications of the cupboard are as follows:

*   The length of the cupboard is 1 200 mm.
*   The depth of the cupboard is 600 mm.
*   The height of the cupboard is 2 400 mm including a 90 mm plinth.
*   The length of the shelve section is 400 mm.
*   The thickness of the material you are provided with is 20 mm processed board.
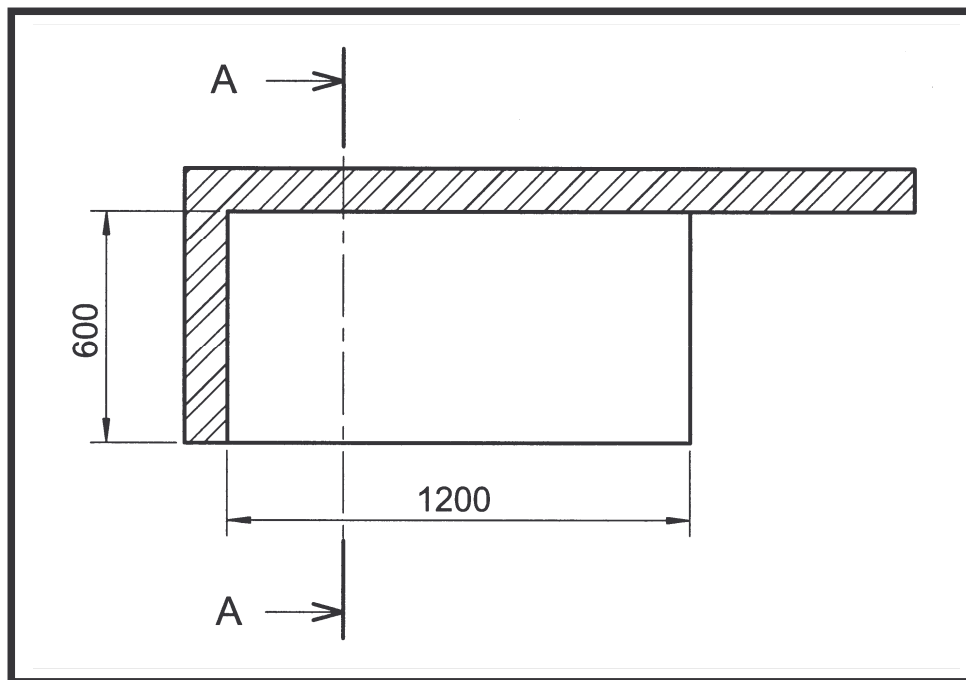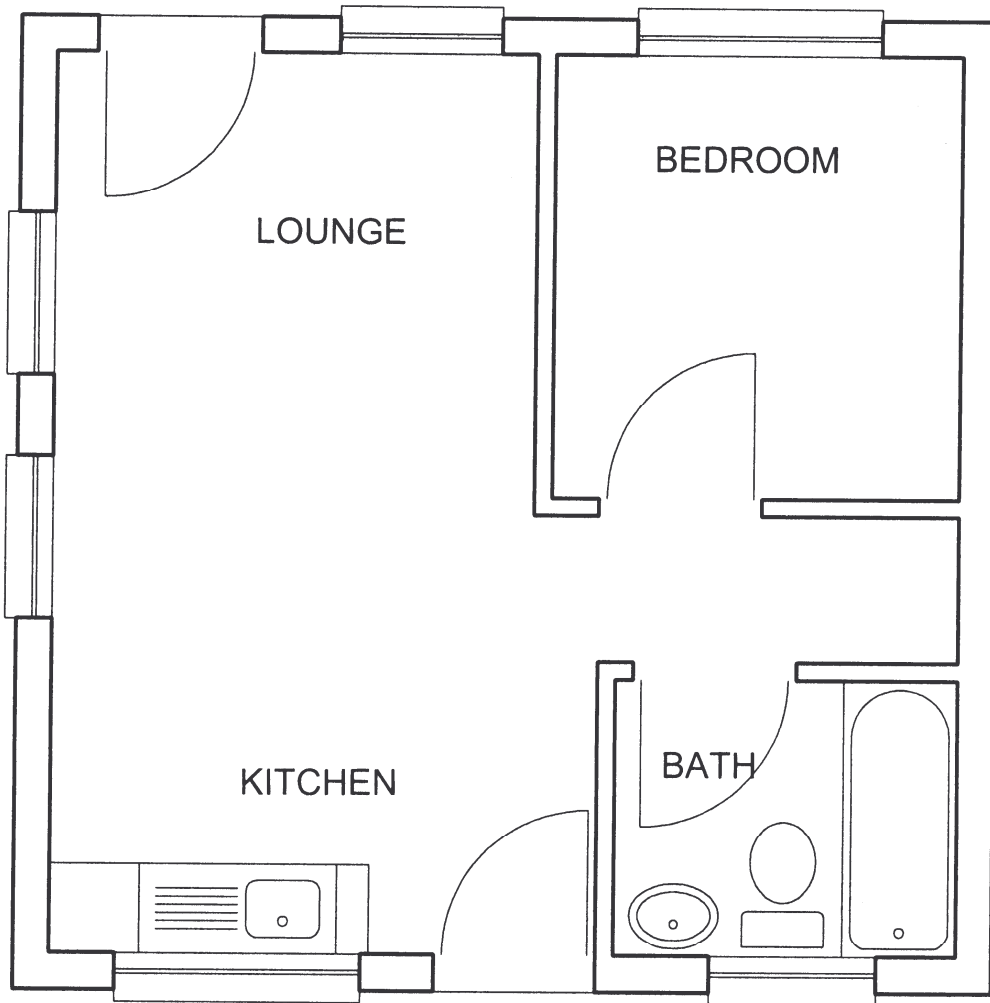

(20)
[40]

TOTAL: 200

ANSWER SHEET

QUESTION 3.3

CANDIDATE'S NAME: _____ **GRADE: 11** _____

ANSWER SHEET

QUESTION 4.4

A	B	C	D
			Centre line:
			(4)
			Area for super structure:
			(2)
			Area for the door opening:
			(2)
			Area for the window opening:
			(2)
			Total area of superstructure:
			(3)
			Number of bricks for the superstructure:
			(4)

CANDIDATE'S NAME: _____ **GRADE: 11 _____**