



CIVIL TECHNOLOGY

Time: 3 hours

200 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 12 pages, a Formula Sheet and an Answer Booklet of 9 pages (i – ix). Please check that your question paper is complete.
2. This question paper consists of six questions.
3. Read all the questions carefully.
4. Answer all the questions.
5. Answer each question as a whole, do not separate sub questions.
6. Sketches may be used to illustrate your answer.
7. Use the mark allocation as a guide to the length of your answer.
8. Drawings and sketches must be done in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the SANS/SABS Code of Practice for Building Drawing Practice.
9. For the purpose of this paper, the size of a brick should be taken as 220 mm × 110 mm × 75 mm.
10. Use your own discretion where dimensions and or details have been omitted.
11. Drawings in this paper are not to scale due to electronic transfer.

REQUIREMENTS:

1. Drawing instruments
 2. A non-programmable calculator
 3. Answer Booklet
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QUESTION 1 CONSTRUCTION, SAFETY AND MATERIAL

- 1.1 What is the primary objective of the Occupational Health and Safety Act? (2)
- 1.2 Name FIVE safety regulations regarding the erection and maintenance of scaffolding. (5)
- 1.3 Read the question carefully and choose a description from COLUMN B that matches an item in COLUMN A. On the Answer Booklet write only the correct letter next to the corresponding number, e.g. 1.3.10 – K.

COLUMN A	COLUMN B
1.3.1 Pollution	A digging of trenches, holes, etc.
1.3.2 By-product	B an unsupported projecting beam at one end of the beam
1.3.3 Cutting list	C a restriction that prevents you from building in a specific area
1.3.4 Excavations	D product which is derived from the making of another product
1.3.5 Cantilever	E description and size of materials required to build a specific object
1.3.6 Jointer	F a top view of a building site
1.3.7 Angle grinder	G tension – opposing twisting force in metal
1.3.8 Symbols	H a hand tool used in shaping the space between bricks
1.3.9 Servitude	I contamination of air, soil or water
	J machine used in cutting materials.
	K figure or sign that shows how different items and material can be indicated on a drawing

(9)

- 1.4 Draw a neat sketch of the SA truss (Howe truss) to indicate the following parts of the roof:

Rafter, King post, Tie beam, Wall plate, Span, Rise, Wall, Queen post,
Strut/Brace

(10)

- 1.5 A person is in contact with an electrical wire and is being electrocuted/shocked. Describe in sequence, the measures you need to take to try and save the person's life.

(4)

[30]

QUESTION 2 ADVANCED CONSTRUCTION AND EQUIPMENT

- 2.1 A friend of yours is extending their house and heard that the developer is putting up a rib and block construction for the first floor.
- 2.1.1 Show by means of a neat sketch with labels a rib and block that can be used for a suspended floor. (4)
- 2.1.2 Name TWO factors that need to be taken into account when deciding on the type of suspended floor to be used. (2)
- 2.2 As a carpenter on a building site, name FOUR different ways that you will care for and maintain your hand tools. (4)
- 2.3 A square concrete column 300 mm × 300 mm is being erected to support part of a roof at your school. Draw to scale 1 : 5 on the Answer Booklet provided, the horizontal section of the column. Label any three parts of the formwork and reinforcing used in the column. (10)

Specifications:

- Column 300 mm × 300 mm
- Clamps 76 mm × 50 mm
- Shutter board 30 mm thick
- Yokes 76 mm × 50 mm
- Wedges
- 20 mm diameter threaded rods with nuts
- 20 mm reinforcing bars
- Stirrup of 10 mm

2.4 FIGURE 2.4 shows a dumpy level on a site with different readings taken at specific points. Using the datum level reading given as **3,355** at A, answer the following questions:

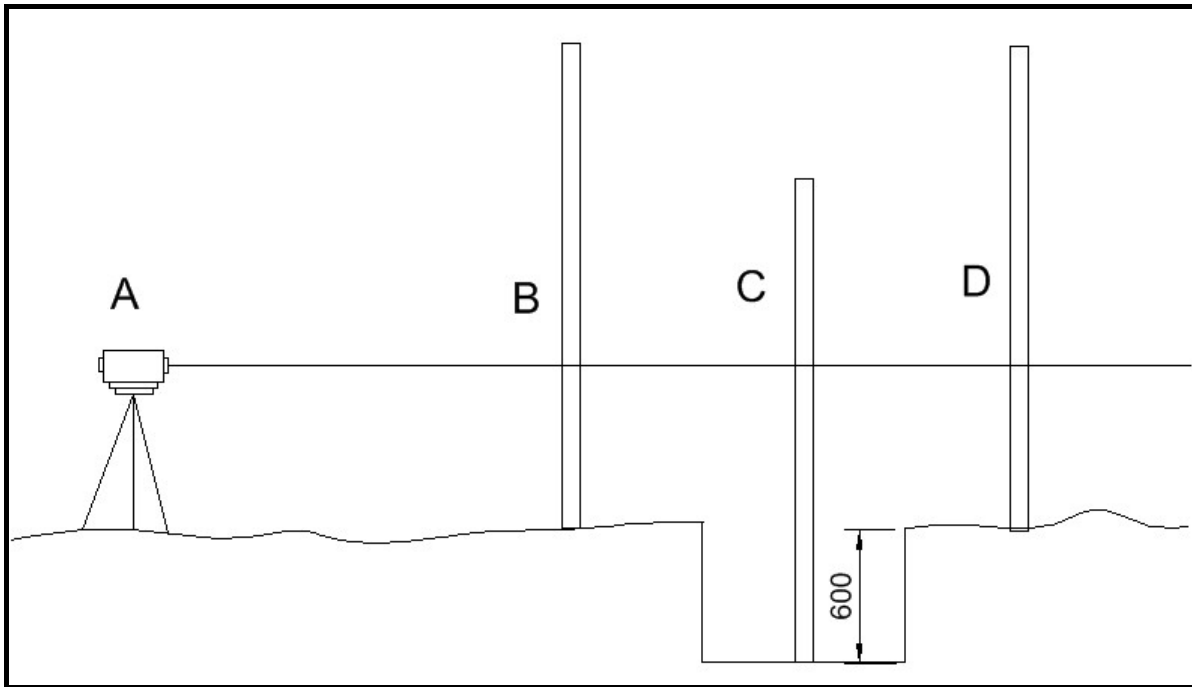


Figure 2.4

2.4.1 Calculate the distance of staff B from the dumpy level if the upper stadia line reads 2,250 and the lower stadia line reads 1,750. (2)

2.4.2 The foundation depth at C is 600 mm. Show by means of a sketch what you will see through the eyepiece of the dumpy level when reading the telescopic staff at C. The following must be shown in your sketch:

- Vertical outside lines of staff (1)
- Circle of eyepiece (1)
- Top and bottom stadia lines (1)
- Horizontal and vertical hair lines (1)
- Height of C (1)

2.4.3 The reading at D on the staff is 2,550. Determine if there is a rise or fall from point A to D and calculate how much the rise or fall will be. Show all calculations and write either RISE or FALL to indicate the slope from A to D. (3)

2.5 Drywalls get their name from the fact that they are built without using any cement or mortar.

2.5.1 State TWO advantages in using drywalls. (2)

2.6 FIGURE 2.6 below shows a diagram of a certain type of arch. Write the numbers 1 – 5 down below one another and state the name of the specific part of the arch and type of arch.

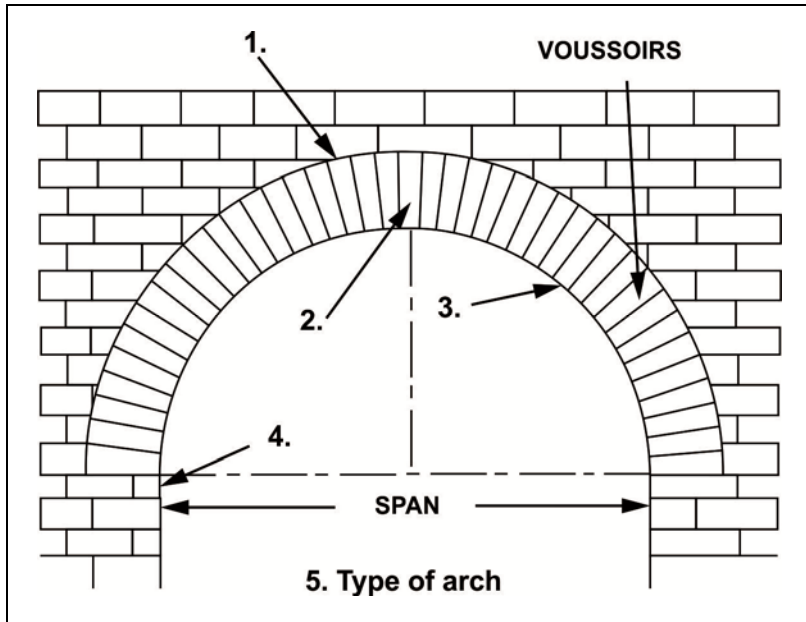


Figure 2.6

(5)

2.7 Name THREE different types of pile foundations that will be used in subsoil with a high moisture content.

(3)

[40]

QUESTION 3 CIVIL SERVICES

- 3.1 Briefly describe a conservancy and a septic tank under the following headings:
- 3.1.1 Difference between the TWO systems (6)
 - 3.1.2 Where each system will be used (2)
- 3.2 FIGURE 3.2 in the Answer Booklet shows the sectional view of an incomplete double storey dwelling. Draw on your Answer Booklet a line diagram of the typical water installation from the household stop cock to the tap discharge of sanitary fitments. (8)
- 3.3 FIGURE 3.3 in the Answer Booklet shows an incomplete floor plan of a basic single room dwelling. In the Answer Booklet provided draw the following electrical drawing symbols on the floor plan:
- 3.3.1 FOUR switch socket outlets throughout the house (4)
 - 3.3.2 A double tube fluorescent light in the kitchen area (1)
 - 3.3.3 A filament light in the lounge, bathroom and bedrooms (2)
 - 3.3.4 A wall mounted filament light outside the external door and sliding door (1)
 - 3.3.5 Single pole one way switch for each light fixture (4)
 - 3.3.6 Wiring from switches to lights (2)
- [30]**

QUESTION 4 MATERIALS, QUANTITIES AND JOINING

- 4.1 Name THREE different methods that can be used to cure a floor slab. (3)
- 4.2 You have been approached by a developer to help him choose a material for window frames at the coast (high rainfall area). State the material that you will recommend and TWO reasons why you chose that specific material. (3)
- 4.3 Roof trusses is vital to carry the weight of the roof covering and to be stable during weather changes.
- 4.3.1 How will you secure a roof truss onto the wall of a dwelling? (1)
- 4.3.2 Name TWO different methods to join the members of a roof truss together. (2)
- 4.4 A room in your house needs to have the ceiling replaced. The internal dimensions of the room are 4 500 mm × 3 500 mm.
- 4.4.1 Determine the number of ceiling boards you will buy if one ceiling board measures 3 600 mm × 900 mm. (4)
- 4.4.2 Determine how many lengths of cornice you will need if one cornice is 2 700 mm long. (3)
- 4.5 Name TWO different ways that the bathroom cabinet can be fixed to the wall of the bathroom. (2)

4.6 FIGURE 4.6 below shows the floor plan of a simple dwelling.

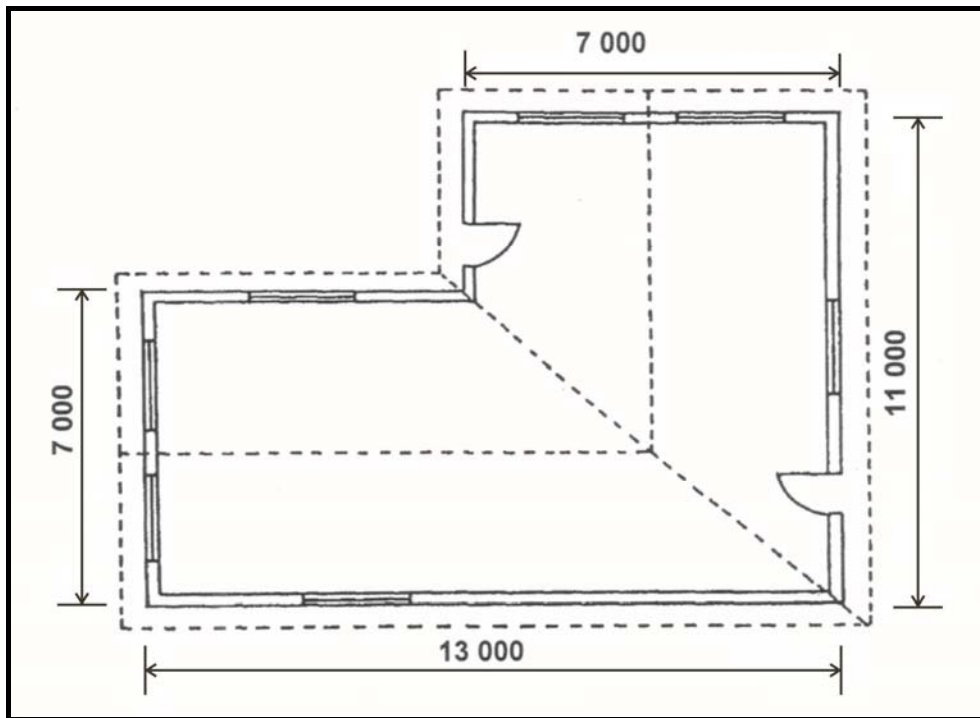


Figure 4.6

In the Answer Booklet provided use the quantity surveying sheet to calculate the total number of bricks required to build the super structure only. Take into account a 5% breakage of the bricks. (Only use ONE number after the decimal.)

Specifications:

- Super structure height = 2 800 mm
- All windows are = 2 000 mm × 1 200 mm
- Door = 2 000 mm × 900 mm
- Number of bricks = 52 bricks / m² for a half brick wall
- External walls = 220 mm thick
- Breakage of bricks = 5%

(12)
[30]

QUESTION 5 APPLIED MECHANICS

- 5.1 FIGURE 5.1 below shows a shaped lamina. Study the lamina below and calculate the position of the centroid from axis AA. All dimensions are in millimetres. Round your answer off to two decimals. (8)

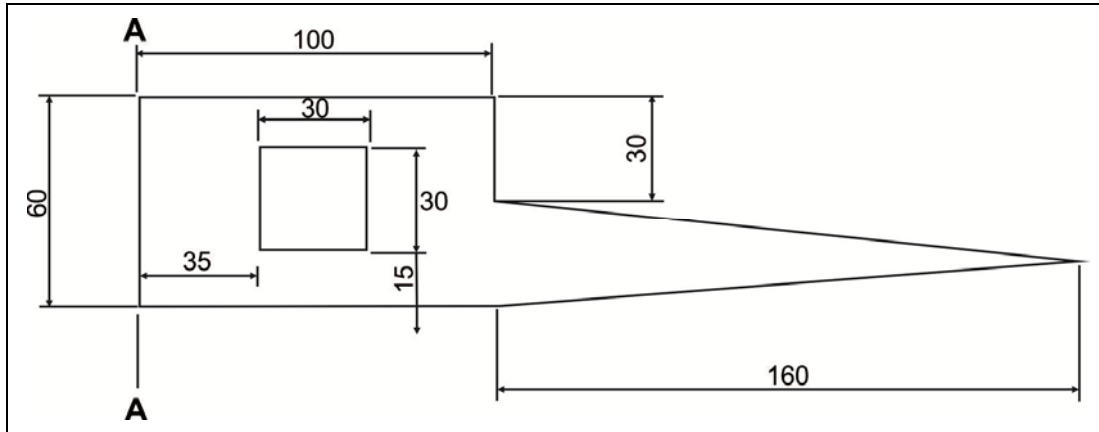


Figure 5.1

- 5.2 FIGURE 5.2 below shows the space diagram of a beam with THREE point loads and ONE uniformly distributed load. The length of the beam is 9 m. Study the beam carefully and answer the following questions:

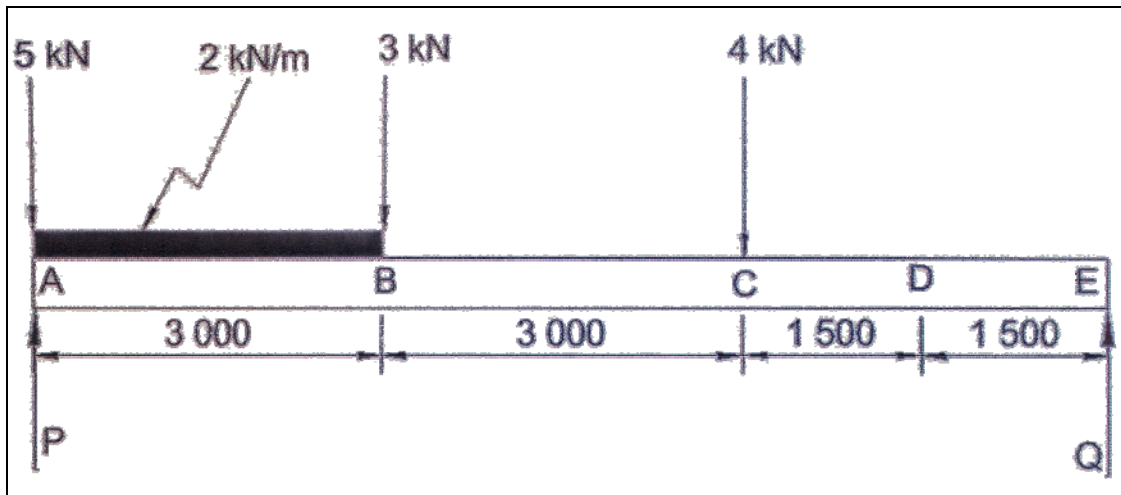


Figure 5.2

- 5.2.1 Calculate the reaction forces at P and Q. Check your answer by comparing the upwards and downwards forces. (5)
- 5.2.2 Draw the shear force diagram. Use an appropriate scale. (4)
- 5.2.3 Calculate the bending moment at B from reaction point P. (3)

5.3 FIGURE 5.3 below shows a framework of a truss.

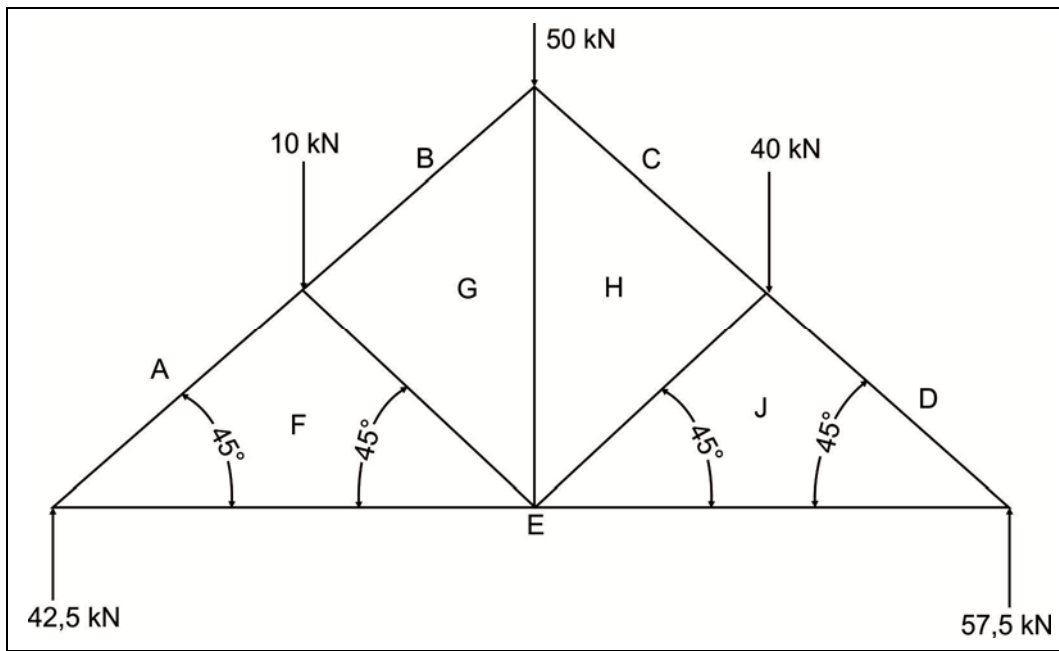


Figure 5.3

In the Answer Booklet, finish the incomplete vector diagram and determine the nature and magnitude of the indicated members from the vector diagram and fill in the Answer Booklet.

MEMBER	NATURE	MAGNITUDE
GF	Strut	A
FE	Tie	B
GH	C	25 kN
JH	D	28 kN

(10)
[30]

QUESTION 6 GRAPHICS AND COMMUNICATION

6.1 FIGURE 6.1 below shows an incomplete sectional view of a dwelling. Study the sectional view below and answer the questions on the table in the Answer Booklet.

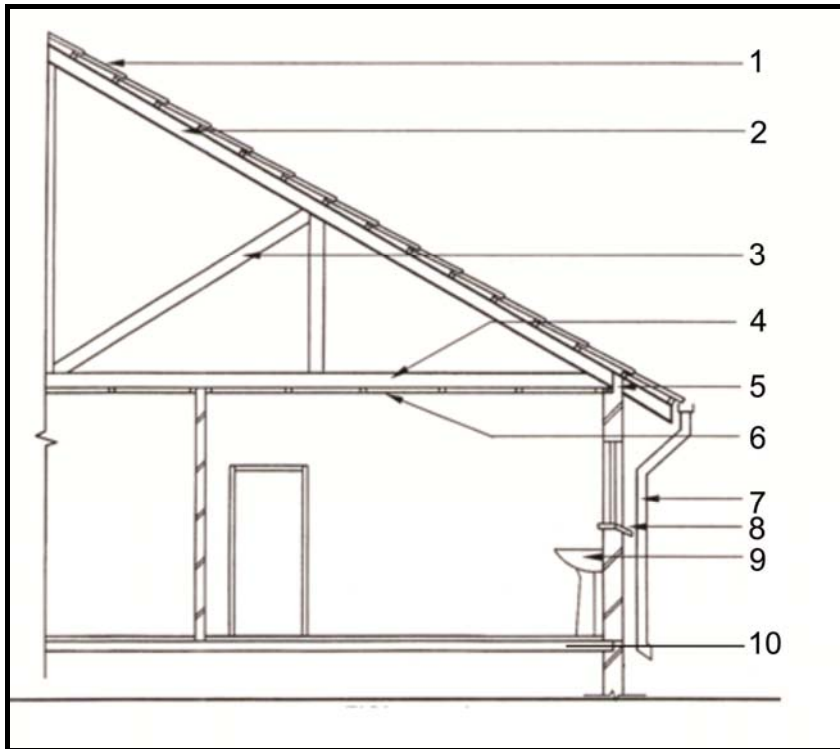


Figure 6.1

[DBE, November 2011]

(15)

6.2 FIGURE 6.2 below shows a line diagram of an incomplete floor plan of a single bedroom granny flat. (Use your own discretion where details have been omitted.)

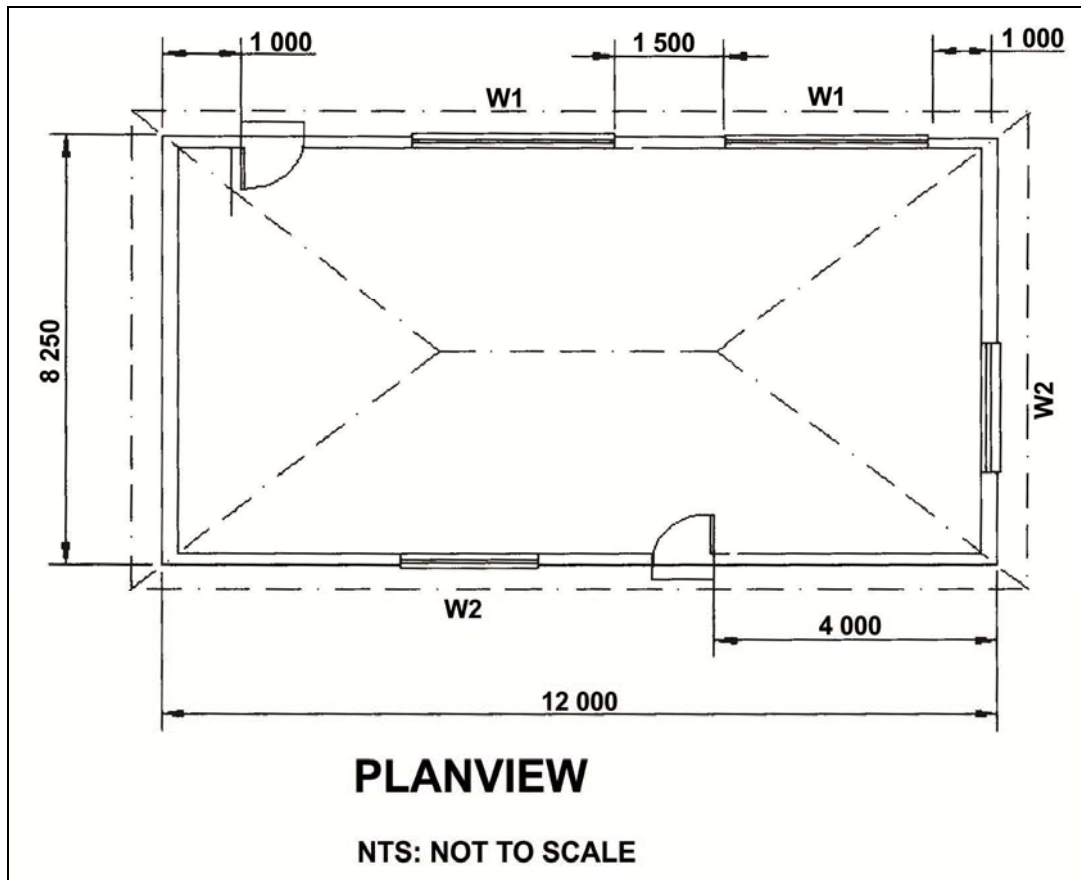


Figure 6.2

6.2.1 On the Answer Booklet Question 6.2.1 re-design and draw to a scale of 1 : 75 the structure on the given plan view to indicate the following:

- ONE Bedroom
- Bathroom
- Open plan kitchen and lounge

Specifications:

- External walls – 220 mm thick
- Internal walls – 110 mm thick
- All door openings are 900 mm wide
- Window (W1) is 1 500 mm wide
- Window (W2) is 1 200 mm wide

Indicate the following on your plan view:

- North symbol
- A shower, wash basin and water closet in bathroom
- Built-in-cupboard
- Title and scale
- Double sink in kitchen

(25)
[40]

Total: 200 marks