



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**CIVIL TECHNOLOGY: CONSTRUCTION**

**EXEMPLAR 2018**

**MARKS: 200**

**TIME: 3 hours**

**This question paper consists of 17 pages and 5 answer sheets.**

**REQUIREMENTS:**

1. Drawing instruments
2. A non-programmable calculator
3. ANSWER BOOK

**INSTRUCTIONS AND INFORMATION**

1. This question paper consists of SIX questions: TWO questions are generic and FOUR questions are subject specific.
2. Answer ALL the questions.
3. Answer each question as a whole. Do NOT separate subsections of questions.
4. Start the answer to EACH question on a NEW page.
5. Do NOT write in the margins of the ANSWER BOOK.
6. You may use sketches to illustrate your answers.
7. Write ALL calculations and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
8. Use the mark allocation as a guide to the length of your answer.
9. Make drawings and sketches in pencil, fully dimensioned and neatly finished off with descriptive titles and notes to conform to the *SANS/SABS Code of Practice for Building Drawings*.
10. For the purpose of this question paper, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. Use your own discretion where dimensions and/or details have been omitted.
12. Answer QUESTIONS 2.1, 2.2, 3.1, 3.2, 5.6 and 6.10 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. Write your CENTRE NUMBER and EXAMINATION NUMBER on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have used them or not.
14. Due to electronic transfer, drawings in the question paper are NOT to scale.
15. Google images was used as source for all photographs and pictures.

**QUESTION 1: OHSA, MATERIALS, TOOLS, EQUIPMENT AND JOINING (GENERIC)**

Start this question on a NEW page.

- 1.1 Choose a description from COLUMN B that matches an item in COLUMN A. Write only the letter (A–L) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 M.

COLUMN A		COLUMN B	
1.1.1	Curing	A	used by only one person at a time
1.1.2	Ladder	B	corrosion proof
1.1.3	Builder's hoist	C	applied to the base metal – makes the metal corrosion resistant
1.1.4	Zinc coating	D	temporary structure that allows workmen to work comfortably above chest height
1.1.5	Scaffold	E	quick method of transferring tools and equipment between floors
1.1.6	Chute	F	metal dipped in molten zinc
1.1.7	Electroplating	G	can be applied with a brush
1.1.8	Paint	H	process of keeping freshly cast concrete moist for a specific period
1.1.9	Aluminium	I	process of coating a metal with a thin layer of another metal by electrolysis
1.1.10	Galvanised	J	quick method of sending rubble and debris to ground floor
		K	can be applied in powder form
		L	prevent splashing of chemicals

(10 x 1)

(10)

1.2 FIGURE 1.2 below shows a surveying tool used on a construction site

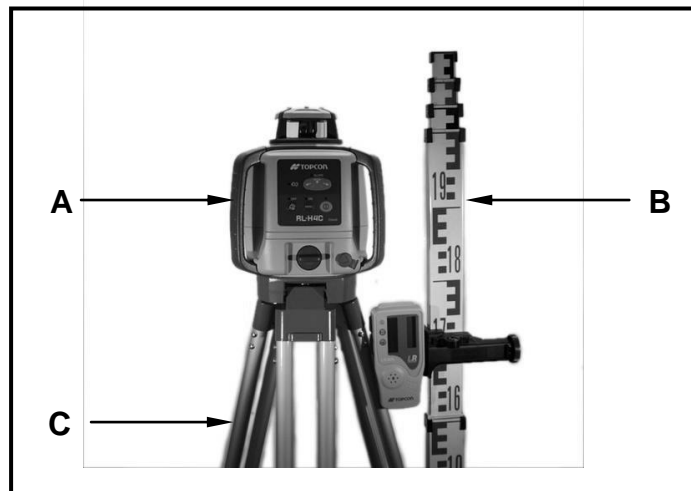


FIGURE 1.2

1.2.1 Identify parts **A–C**. (3)

1.2.2 Explain how will you take care of part **A**. (1)

1.3 FIGURE 1.3 below shows a scaffold with a working platform.

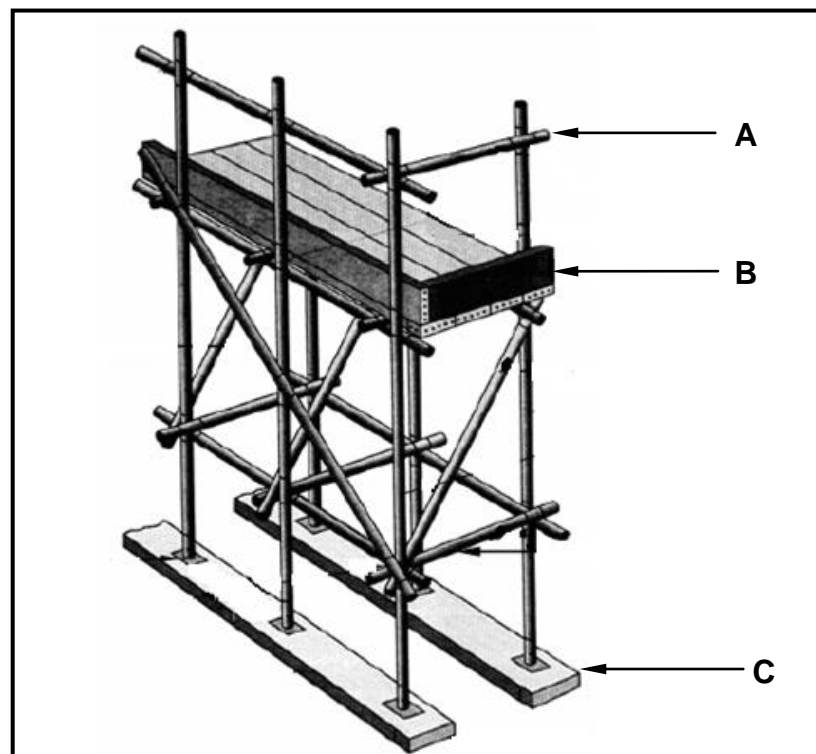
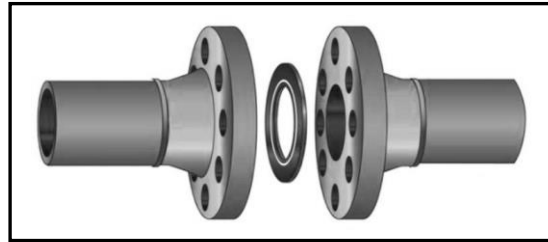


FIGURE 1.3

1.3.1 Describe TWO safety precautions that you will take when working on a scaffold. (2)

1.3.2 Explain the purpose of part **A** in terms of safety. (1)

- 1.3.3 What safety feature does **B** provide? (1)
- 1.3.4 Explain what will happen if part **C** is omitted when workers are working on the platform. (1)
- 1.4 FIGURE 1.4 below shows two pipes with flanges. Recommend a suitable fastener to join the two flanges.



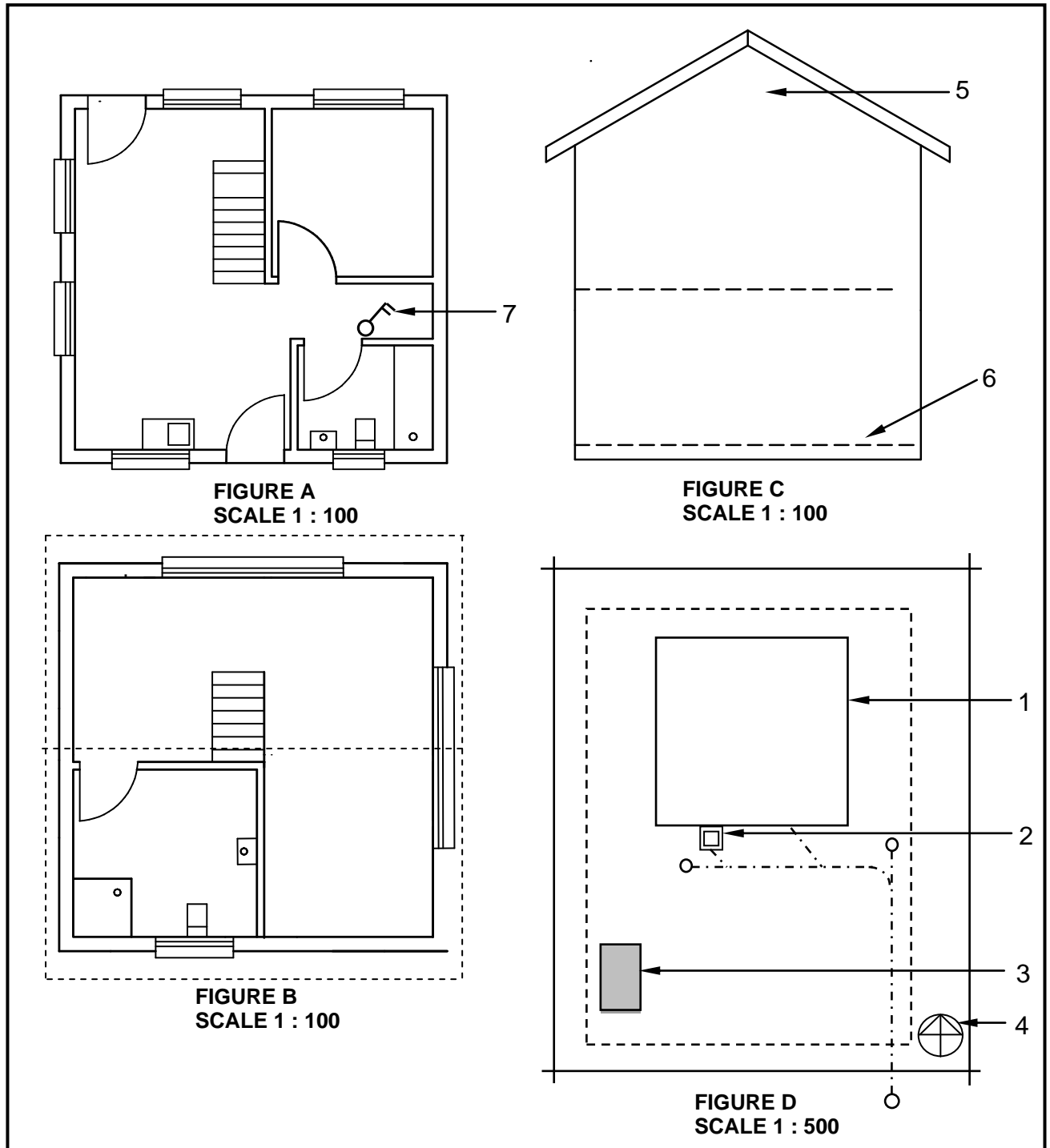
**FIGURE 1.4**

(1)  
**[20]**

**QUESTION 2: GRAPHICS AS METHOD OF COMMUNICATION (GENERIC)**

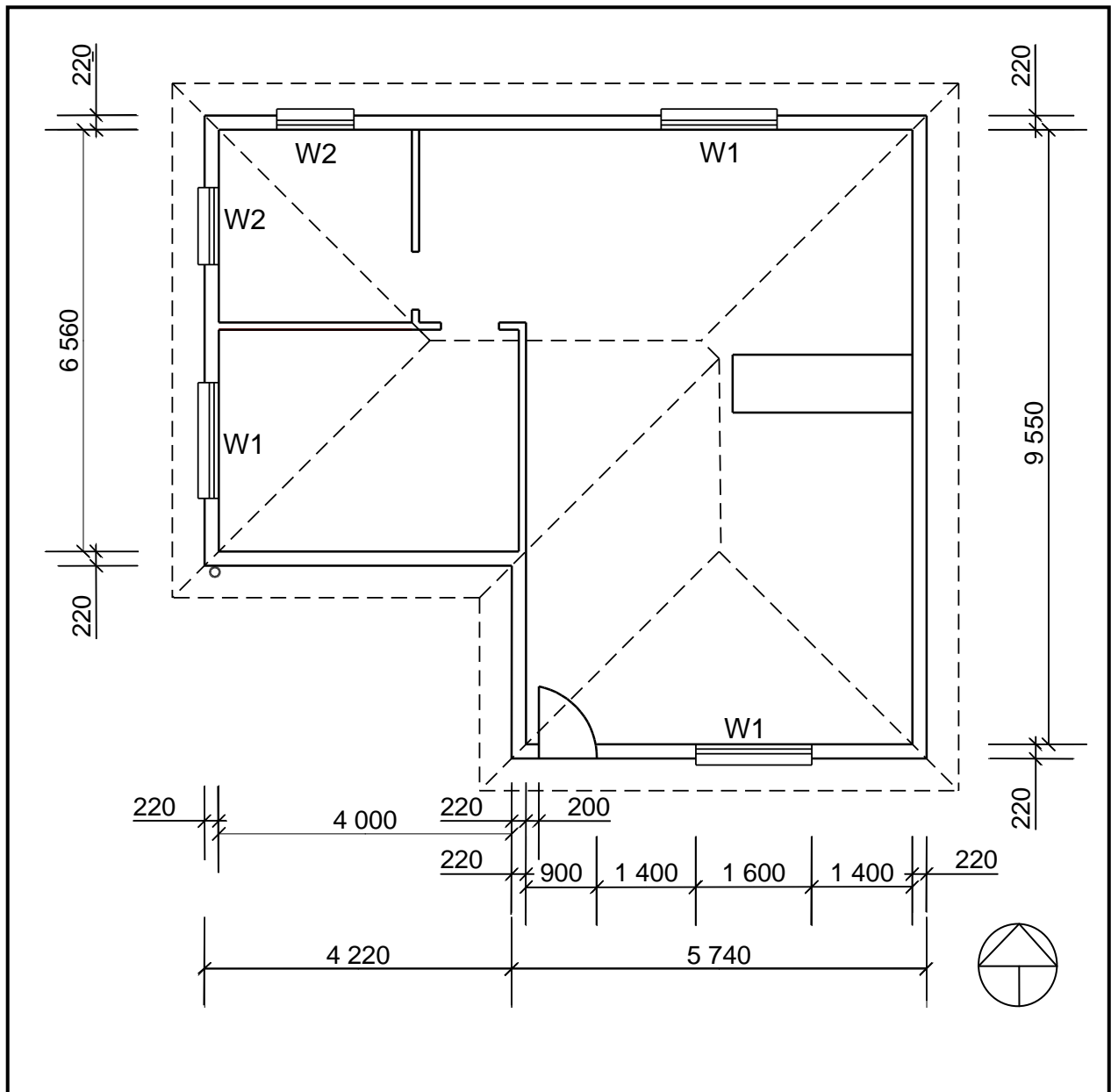
Start this question on a NEW page.

2.1 FIGURE 2.1 below shows different drawings that appear on a building plan. Analyse the drawings and complete the table on ANSWER SHEET 2.1.



**FIGURE 2.1**

2.2 FIGURE 2.2 below shows an incomplete floor plan of a proposed dwelling.



**FIGURE 2.2**

Study FIGURE 2.2 and develop and draw, on ANSWER SHEET 2.2, to scale 1 : 50, the SOUTH ELEVATION of the building. Use the following specifications. (Use the assessment criteria on ANSWER SHEET 2.2 as a guideline for your drawing.)

**SPECIFICATIONS:**

- The height between the natural ground level and the top level of the floor slab is 500 mm.
- The height between the floor slab and the underside of the wall plate is 2 600 mm.
- The roof is covered with corrugated galvanised sheeting and is finished with 220 mm wide fascia boards.
- Ridge capping is 100 mm high.

- Rainwater downpipes are 75 mm in diameter and 100 mm square gutters are used.
- A rainwater downpipe should be placed at the corner of the building, as indicated on the floor plan.
- The eaves overhang is 500 mm.
- The door opening is 2 100 mm high and 900 mm wide.
- The door step is 250 mm high.
- The building has a gable roof with a pitch of 30°.

The following must also be shown on the drawing:

- The method used to determine the roof height
- Window sills
- ONE rainwater downpipe

Windows and doors:

<b>WINDOWS AND DOORS</b>	<b>WIDTH</b>	<b>HEIGHT</b>
Window 1 (W1)	1 600	1 200
Door openings 1 (D1)	900	2 100

THREE marks will be allocated for the application of the scale.

Start the drawing from corner **A**, as indicated in the bottom left-hand corner of ANSWER SHEET 2.2.

(25)  
[40]



**QUESTION 3: ROOFS AND STAIRCASES (SPECIFIC)**

Start this question on a NEW page.

- 3.1 What is the minimum pitch of a double pitched roof truss? (1)
- 3.2 What will be the consequence if purlins are spaced further apart than the recommended maximum distance? (1)
- 3.3 Name THREE types of roof trusses, besides a couple roof truss, which can be used on a building. (3)
- 3.4 Differentiate between the spacing of roof trusses for *corrugated roof sheeting* and for *clay tiles*. (2)
- 3.5 Explain ONE advantage of roof underlay. (1)
- 3.6 Use ANSWER SHEET 3.6 and draw a neat sketch, in good proportion, of the construction at the ridge of a king post roof truss. Gang nails are used to join different members.

Show the following on the drawing:

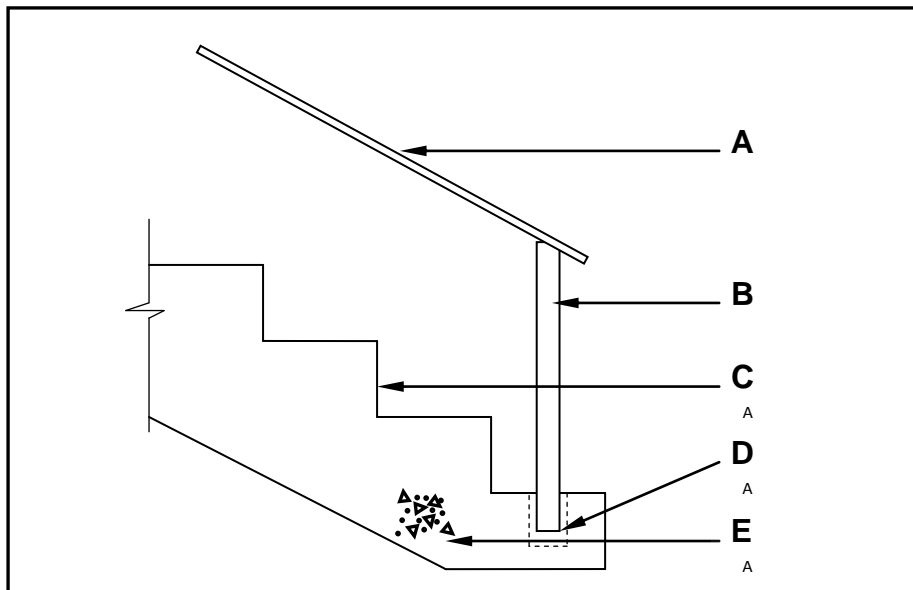
- Only part of the rafters at the ridge of the roof
- Part of the king post
- TWO purlins on each rafter
- Roof sheeting
- Ridge capping (7)

- 3.7 Use ANSWER SHEET 3.7 and draw a neat sketch, in good proportion, of a couple roof truss with a span of 3 metres and a slope of 45°.

Show the following on your drawing:

- Span
- Walls
- Wall plates
- Rafters
- Ridge beam (7)

- 3.8 FIGURE 3.8 below shows the vertical cross section of part of a concrete staircase. Study FIGURE 3.8 and answer the questions that follow.



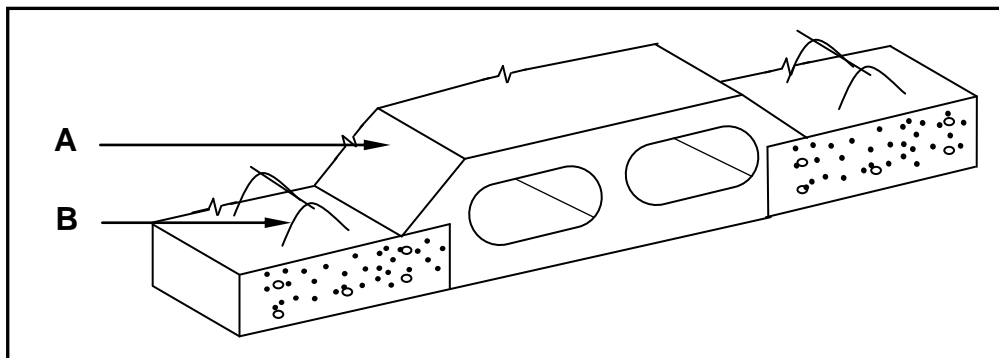
**FIGURE 3.8**

- 3.8.1 Name the parts labelled **A–E**. (5)
- 3.8.2 What is the minimum distance between the handrail and the tread? (1)
- 3.8.3 Predict what will happen if there is no intermediate support under part **A**. (1)
- 3.8.4 Recommend the most effective tool to use for the compaction of concrete. (1)
- [30]**

**QUESTION 4: CONCRETE FLOOR, EXCAVATIONS AND FORMWORK (SPECIFIC)**

Start this question on a NEW page.

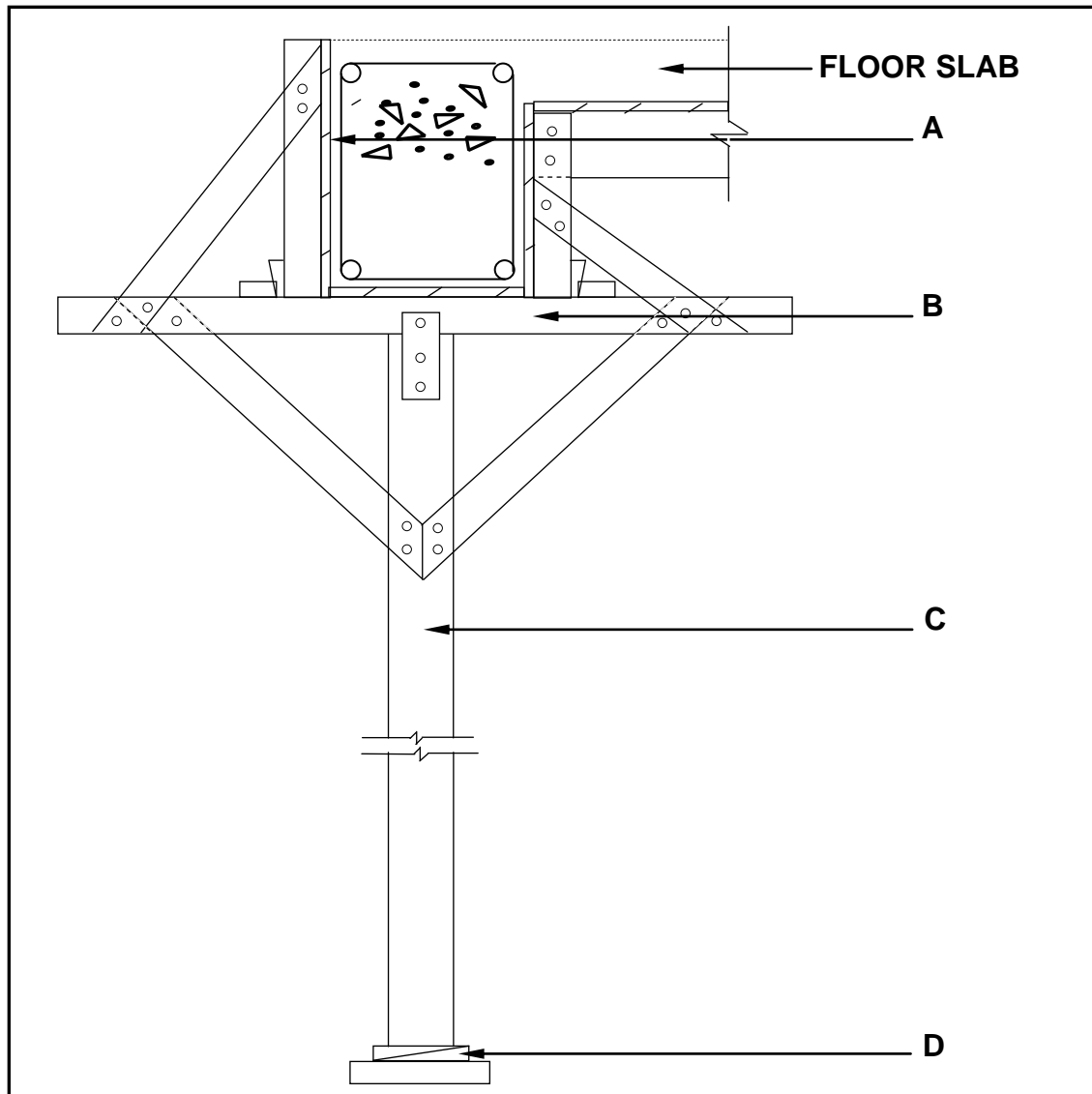
- 4.1 Explain FOUR aspects to be considered during the installation of a rib and block suspended concrete floor. (4)
- 4.2 Name THREE components of a rib and block floor. (3)
- 4.3 Explain THREE procedures that should be followed to prepare a wall to support a rib and block concrete floor. (3)
- 4.4 FIGURE 4.4 below shows a part of a rib and block floor. Study FIGURE 4.4 and answer the questions that follow.



**FIGURE 4.4**

- 4.4.1 Explain ONE reason for the holes in **A**. (1)
- 4.4.2 Explain the purpose of **B**. (1)
- 4.4.3 Recommend ONE type of material for the manufacturing of **A**. (1)
- 4.5 Excavation of soil to establish a firm foundation is necessary on a building site.
- 4.5.1 Explain THREE safety factors that should be considered during the planning stage before excavation is started. (3)
- 4.5.2 Name TWO instances when trenches should be inspected. (2)
- 4.5.3 Motivate why heavy plant equipment should not be used close to deep excavations. (1)
- 4.5.4 State any TWO atmospheric hazards that you will find in a trench that is more than 1,3 metres deep. (2)
- 4.5.5 Describe THREE methods that can be used to level a site. (3)
- 4.6 Describe THREE factors that can cause an excavation to collapse. (3)

- 4.7 Name FOUR materials that can be used to line the formwork to ensure a smoother concrete finish. (4)
- 4.8 Describe the first THREE steps in the erection of the formwork for a concrete beam. (3)
- 4.9 FIGURE 4.9 below is a drawing of a concrete beam with an attached floor slab. Study FIGURE 4.9 and answer the questions that follow.



**FIGURE 4.9**

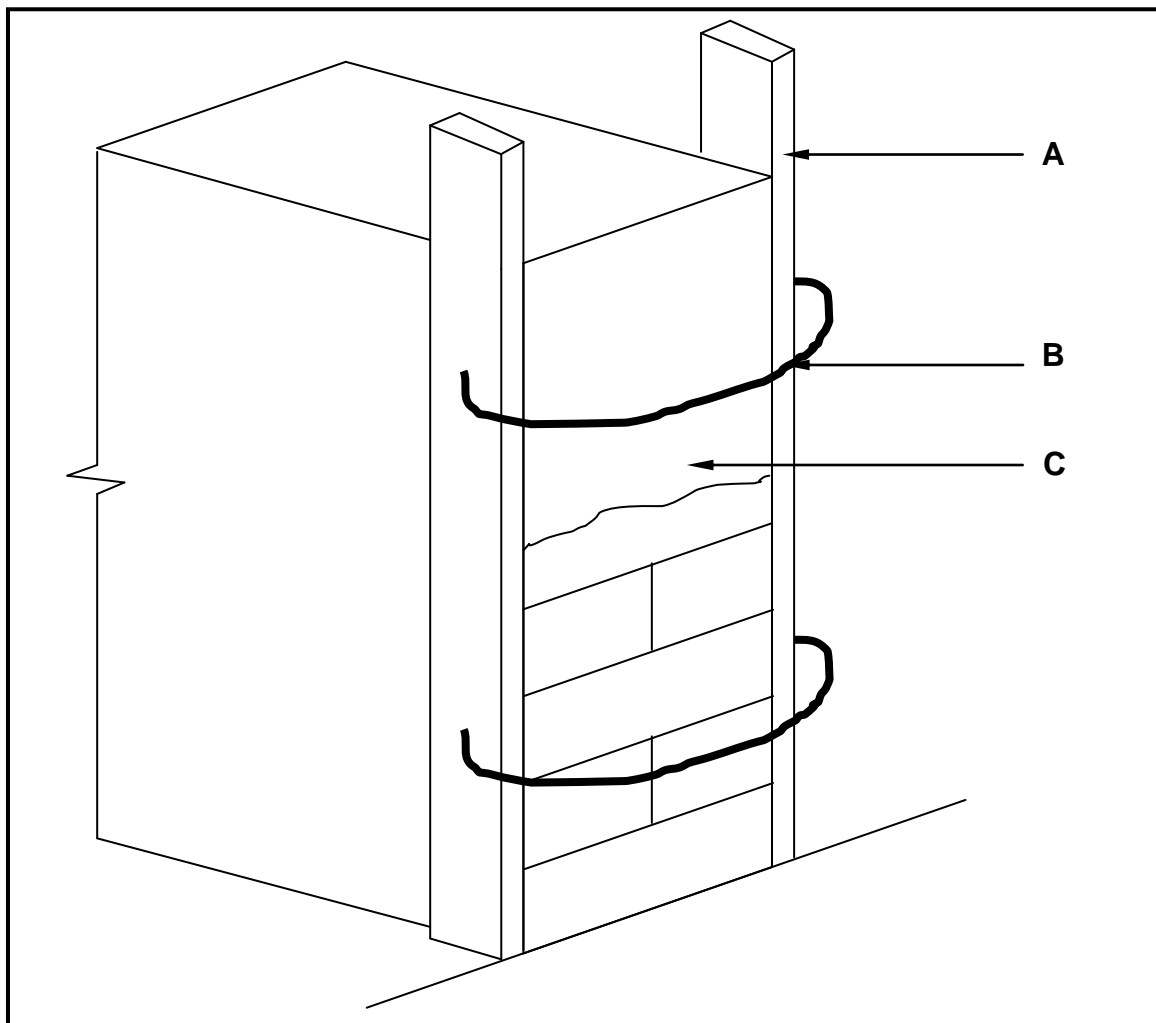
- 4.9.1 Name the parts **A** and **B**. (2)
- 4.9.2 Justify the use of **D** between the sole plate and the prop. (2)
- 4.9.3 Evaluate the drawing in FIGURE 4.9 and comment on the strength of the floor if it is cast as shown. (2)

**[40]**

**QUESTION 5: PLASTER AND SCREED, BRICKWORK (SPECIFIC)**

Start this question on a NEW page.

- 5.1 Name any TWO ingredients of plaster. (2)
- 5.2 State the recommended mix proportion of plaster for interior walls. (1)
- 5.3 FIGURE 5.3 below is a drawing of a construction process. Study FIGURE 5.3 and answer the questions that follow.



**FIGURE 5.3**

- 5.3.1 Name the parts **A–C**. (3)
- 5.3.2 What type of construction process is demonstrated in FIGURE 5.3? (1)
- 5.4 Describe the purpose of skimming plaster. (3)
- 5.5 Calculate the volume of screed, in cubic metres, that is needed to cover a floor with a length of 6 m and a width of 4 m if the thickness of the screed is 20 mm. (4)

- 5.6 Explain the process of preparing the surface of a concrete floor to receive screed. (4)
- 5.7 Use ANSWER SHEET 5.7 and draw a neat sketch, in good proportion, of part of a cavity wall.
- Show the following details on your sketch:
- Concrete foundation
  - Walls
  - Damp-proof course
  - Weep hole
  - Concrete floor
  - Hardcore filling
  - Wall tie
- (8)
- 5.8 Why are wall ties used when constructing cavity walls? (1)
- 5.9 Explain THREE consequences of not installing beam filling. (3)
- [30]**

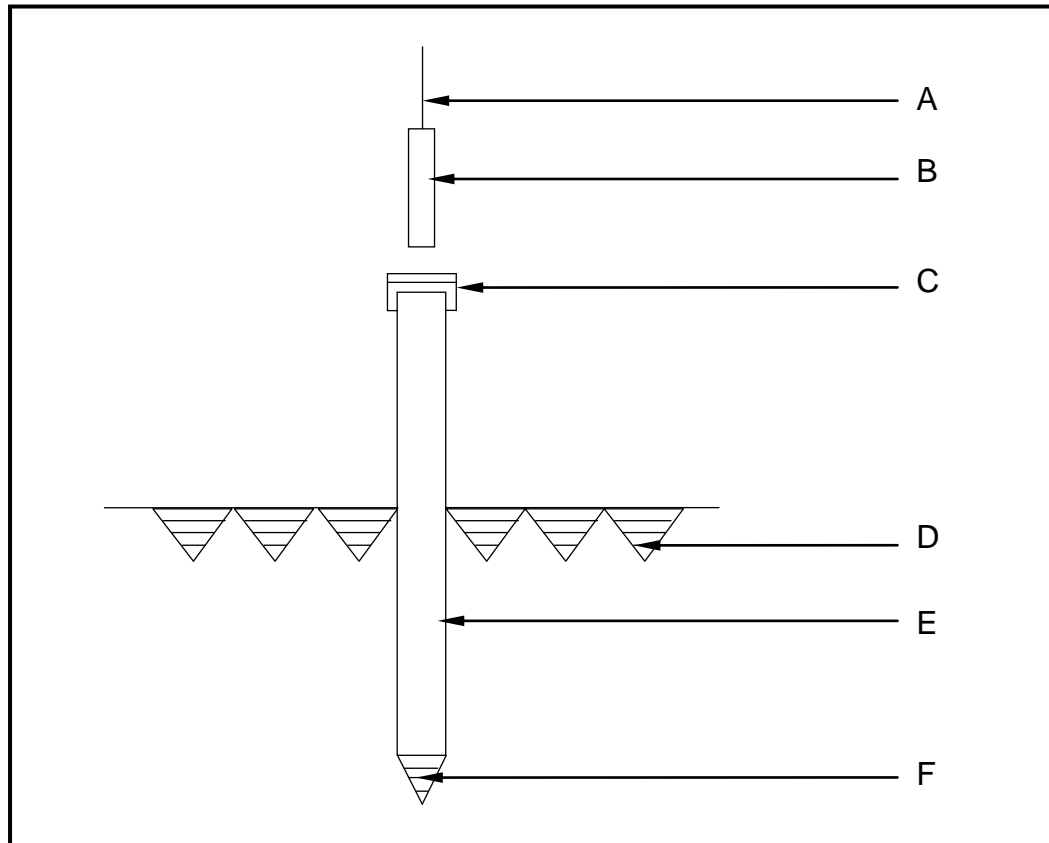
**QUESTION 6: REINFORCEMENT IN CONCRETE AND FOUNDATIONS (SPECIFIC)**

Start this question on a NEW page.

6.1 Various options are given as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (6.1.1 to 6.1.6) in the ANSWER BOOK, e.g. 6.1.7 C

- 6.1.1 Reinforcement is indicated on construction drawings with a code. In the code 9 R 16 01 200, the '9' indicates the ...
- A diameter of the bar.
  - B rod number.
  - C number of rods in the group.
  - D centre-to-centre spacing. (1)
- 6.1.2 Which of the following is NOT a recognised material that is used for reinforcing?
- A Twisted ribbed bar
  - B Round tubing
  - C Ribbed bar
  - D Twisted square bar (1)
- 6.1.3 ... is a defect that occurs in concrete due to shuttering.
- A Cracks
  - B Deflection
  - C Uneven surfaces
  - D Blowholes (1)
- 6.1.4 A foundation is classified as a pile foundation when the depth is more than ... its breadth.
- A two
  - B three
  - C four
  - D five (1)
- 6.1.5 Pile foundations are ... than normal foundations.
- A easier to install
  - B cheaper to install
  - C faster to install
  - D more expensive (1)
- 6.1.6 In situ piles are used instead of prefabricated piles where ...
- A the lengths of the pile foundations differ.
  - B where ready-mixed concrete is not available.
  - C the site cannot be reached by truck.
  - D the soil is too hard to drive piles into the ground. (1)

- 6.2 Explain THREE reasons for using pile foundations. (3)
- 6.3 FIGURE 6.3 below shows a pile being percussion-driven into the ground.



**FIGURE 6.3**

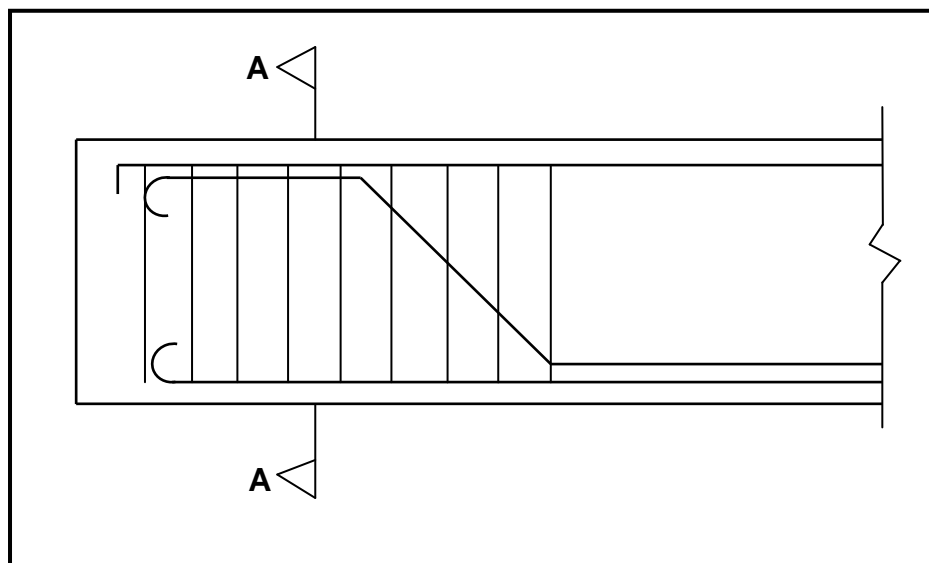
- 6.3.1 Identify the type of pile foundation illustrated in FIGURE 6.3. (1)
- 6.3.2 Label parts **A** to **F**. (6)
- 6.3.3 Predict what will happen if **C** is not used during the installation process of this pile. (2)
- 6.3.4 Explain THREE types of soil where this pile can be used. (3)
- 6.3.5 State ONE advantage of pile foundations. (1)
- 6.4 Structures are reinforced with steel bars to act against forces applied to the structure.
- 6.4.1 Name THREE forces that can act on a structure. (3)
- 6.4.2 Discuss the influence that EACH of the forces which you named in QUESTION 6.4.1, will have on a structure. (3)
- 6.5 Discuss TWO properties of steel reinforcement. (2)



6.6 FIGURE 6.6 below shows part of a rectangular concrete beam that is reinforced with two main bars, two anchor bars and one shear bar.

Draw, in the ANSWER BOOK, a neat instrument drawing, in good proportion, of the cross section of this beam on section line A-A to indicate the following:

- Minimum concrete cover
- Main bars ( $\varnothing$  20 mm)
- Anchor bars ( $\varnothing$  25 mm)
- Shear bar ( $\varnothing$  20 mm)
- Binders/Stirrups ( $\varnothing$  6 mm)
- Symbol for concrete



**FIGURE 6.6**

(8)

6.7 State TWO types of steel that is used for reinforcing.

(2)

**[40]**

**TOTAL: 200**

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**ANSWER SHEET 2.1**

<b>NO.</b>	<b>QUESTIONS</b>	<b>ANSWERS</b>	<b>MARKS</b>
1	Identify FIGURE A.		1
2	Identify FIGURE B.		1
3	Identify FIGURE D.		1
4	What do the short dashed lines in FIGURE B indicate?		1
5	What type of roof is used on this building?		1
6	Name the scale that was used to draw FIGURE B.		1
7	Name the scale that was used to draw FIGURE D.		1
8	On what side of the building is the bathrooms situated?		1
9	What is indicated by number 1?		1
10	What is indicated by number 2?		1
11	What is indicated by number 3?		1
12	What is indicated by number 4?		1
13	What is indicated by number 5?		1
14	What is indicated by number 6?		1
15	What is indicated by number 7?		1
		<b>TOTAL</b>	<b>15</b>

<b>CENTRE NUMBER:</b>																	
<b>EXAMINATION NUMBER:</b>																	

**ANSWER SHEET 2.2**

ASSESSMENT CRITERIA	MARKS	LM
External walls	3	
NGL (correctly indicated)	1	
FFL (correctly indicated)	1	
Window	1	
Window sill	1	
Door opening	1	
Step gable	1	
Fascia board	1	
Barge board	2	
Roof (correctly drawn)	3	
Gutter	1	
Rainwater downpipe	1	
Ridge capping	1	
Determining roof height	2	
Any two labels	2	
Application of scale One or two incorrect = 3 Three or four incorrect = 2 More than five incorrect = 1 No measurement correct = 0	3	
<b>TOTAL</b>	<b>25</b>	

A 

<b>CENTRE NUMBER:</b>																	
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**ANSWER SHEET 3.6**

<b>ASSESSMENT CRITERIA</b>	<b>MARK</b>	<b>CANDIDATE'S MARK</b>
Rafters	2	
King post	1	
Galvanised roof sheet	1	
Purlins	2	
Ridge capping	1	
<b>TOTAL:</b>	<b>7</b>	

<b>CENTRE NUMBER:</b>										
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**ANSWER SHEET 3.7**

<b>ASSESSMENT CRITERIA</b>	<b>MARK</b>	<b>CANDIDATE'S MARK</b>
Span indicated correctly	1	
Walls	2	
Wall plates	1	
Rafters	2	
Ridge beam drawn correctly	1	
<b>TOTAL:</b>	<b>7</b>	

<b>CENTRE NUMBER:</b>										
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**ANSWER SHEET 5.7**

<b>ASSESSMENT CRITERIA</b>	<b>MARK</b>	<b>CANDIDATE'S MARK</b>
Concrete foundation	1	
Cavity walls	2	
Damp-proofing under concrete floor	1	
Weep holes	1	
Concrete Floor	1	
Hardcore filling	1	
Wall tie	1	
<b>TOTAL:</b>	<b>8</b>	