



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**SEPTEMBER 2018**

**CIVIL TECHNOLOGY: CONSTRUCTION**

**MARKS: 200**

**TIME: 3 hours**



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This question paper consists of 17 pages, including 3 answer sheets.

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**REQUIREMENTS:**

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

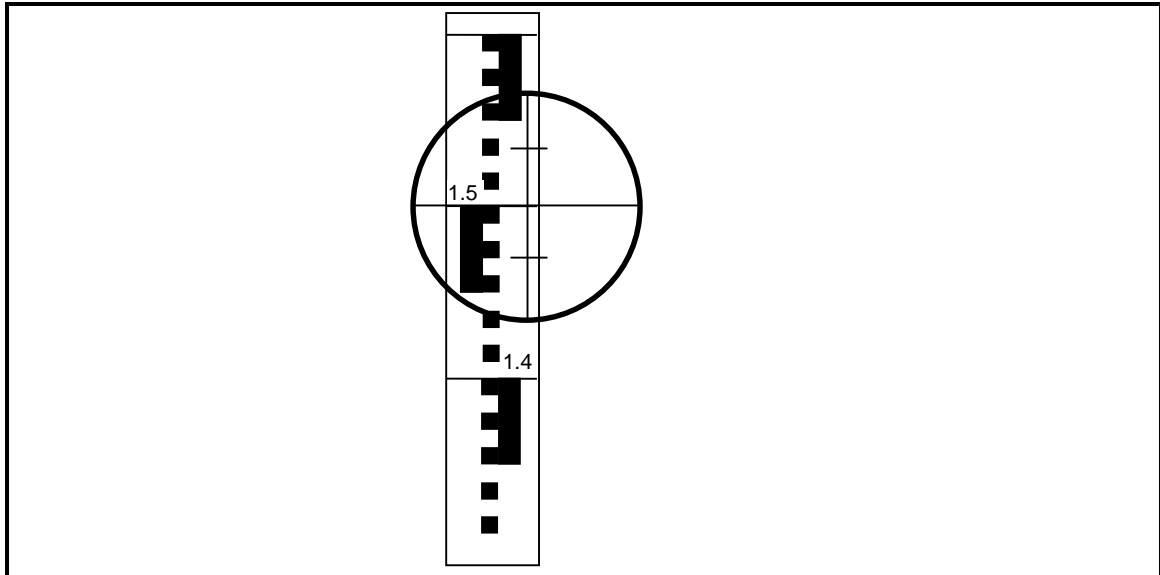
**INSTRUCTIONS AND INFORMATION**

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 answers.
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, 5.8 and 6.4 on the attached ANSWER SHEETS using drawing instruments where necessary.
13. Write your NAME on every ANSWER SHEET and hand them in with your ANSWER BOOK, whether you have answered the question or not.
14. Due to electronic transfer, drawings in the question paper are NOT to scale.

**QUESTION 1: SAFETY, MATERIAL AND EQUIPMENT (GENERIC)**

- 1.1 Indicate whether the following statements with regard to scaffolding are TRUE or FALSE. Write only the word 'true' or 'false' next to the number in the answer book.
- 1.1.1 The planks of a solid wooden scaffold platform are at least 228 mm wide. (1)
- 1.1.2 The planks of a solid wooden scaffold platform may not project more than 250 mm beyond the last prop. (1)
- 1.1.3 The guard rails must be at least 800 mm high. (1)
- 1.1.4 Toe boards must be at least 150 mm high. (1)
- 1.2 Name THREE requirements to which a trestle scaffold must comply with before employers should use it. (3 x 1) (3)
- 1.3 Briefly motivate why aluminium ladders should not be used near electrical wires. (2)
- 1.4 Briefly motivate why wooden ladders must not be painted. (2)
- 1.5 Choose from the descriptions below the FOUR correct descriptions which are applicable to the curing of concrete.  
Write only the FOUR correct question numbers in the ANSWER BOOK.
- 1.5.1 It protects concrete against rust.
- 1.5.2 Improves the durability of concrete.
- 1.5.3 It provides a gloss finish to concrete.
- 1.5.4 Curing is done by means of a tampering rod.
- 1.5.5 It improves the strength of concrete.
- 1.5.6 It provides a protective layer over the concrete.
- 1.5.7 It makes concrete more watertight.
- 1.5.8 It improves the resistance to abrasion. (4 x 1) (4)

- 1.6 Describe in point form the powder-coating process for metals. (3)
- 1.7 Briefly describe ONE use of the dumpy level. (1 x 2) (2)
- 1.8 FIGURE 1.8 shows the dumpy level reading which is taken on the telescopic staff. Answer the following questions with regard to the reading.



**FIGURE 1.8**

- 1.8.1 What is the height reading on the staff? (1)
- 1.8.2 Determine the distance between the dumpy level and the staff. Show all calculations, formulas and units. (4)
- 1.9 Name THREE materials which can be detected in walls by the multi-detector. (3 x 1) (3)
- 1.10 Name the maintenance measures for the multi-detector with reference to the following facets:
- 1.10.1 Cleaning method (1)
- 1.10.2 Storage over a long period (1)

**[30]**

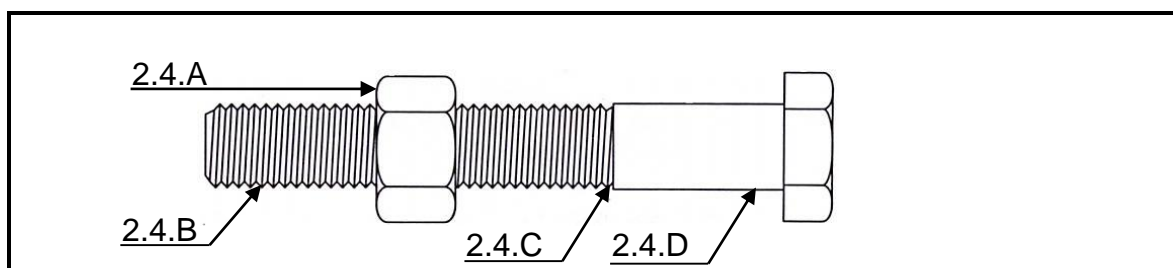
**QUESTION 2: GRAPHICS AND JOINING (GENERIC)**

2.1 Use the information on ANSWER SHEET A and complete the site plan on scale 1 : 200 according to the following requirements:

- 2.1.1 The site boundaries are measured from point A  
The site boundaries in front and back are 23 m long  
The site boundaries on the sides are 25 m long (2)
- 2.1.2 The front building line is 4 m from the site boundary  
The back and side building lines are 2 m from the site boundaries (2)
- 2.1.3 Show the site entrance, 3 m from the western site boundary (1)
- 2.1.4 Show the datum level in the north-eastern corner of the site (1)

Complete the sewage lay-out and abbreviations of the sewage appliances according to the following requirements:

- 2.1.5 The main sewage from the bathroom to the municipal connection (2)
- 2.1.6 The branch sewage to the bathroom and kitchen (2)
- 2.1.7 Manhole on the site, before the municipal connection (2)
- 2.1.8 Rodding eyes (4)
- 2.1.9 Inspection eyes (4)
- 2.2 Name the FOUR particulars of a bolt which must be provided when it is purchased. (4 x 1) (4)
- 2.3 Briefly describe the advantage of the square shoulder bolt. (2)
- 2.4 Name the parts 2.4.A to 2.4.D of the bolt in FIGURE 2.4.



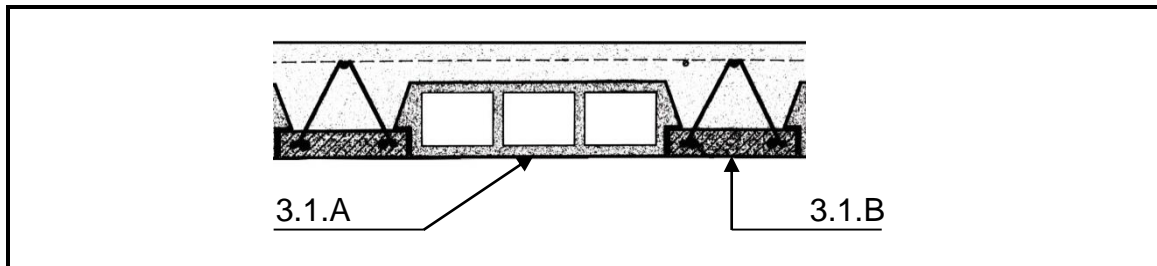
**FIGURE 2.4**

(4 x 1) (4)  
**[30]**

### QUESTION 3: CONCRETE, EXCAVATIONS, FOUNDATIONS AND QUANTITIES (SPECIFIC)

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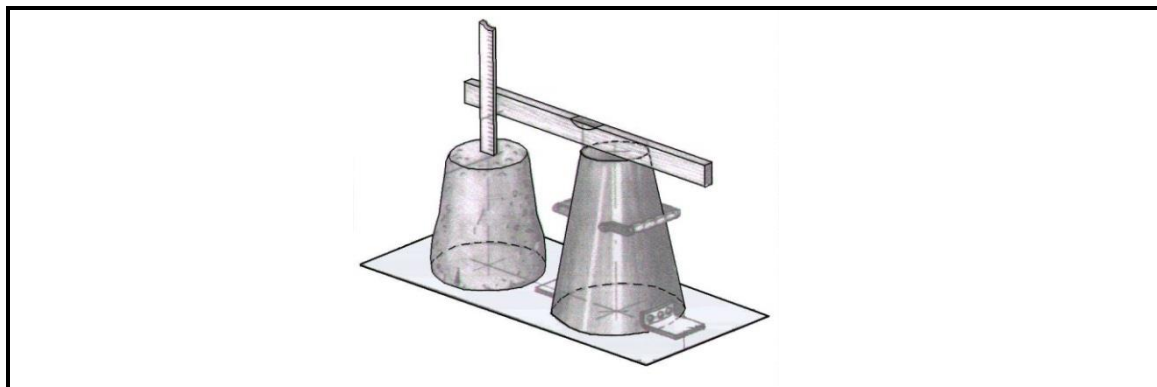
3.1 Answer the questions in regard to the concrete floor in FIGURE 3.1.



**FIGURE 3.1**

- 3.1.1 Name the type of floor construction in FIGURE 3.1. (1)
- 3.1.2 Name the parts 3.1.A and 3.1.B. (2 x 1) (2)
- 3.1.3 Name ONE instance where this floor construction will be used. (1)
- 3.1.4 What is the width of part 3.1.B? (1)
- 3.1.5 What is the total thickness of the concrete floor? (1)

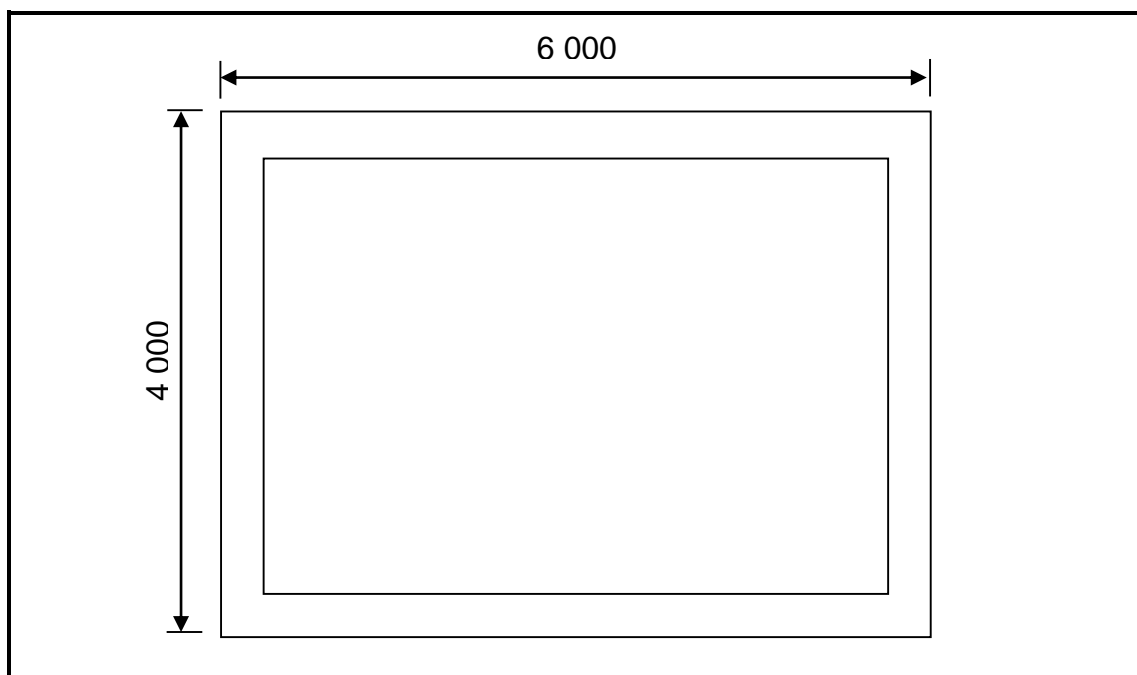
3.2 Answer the questions regarding the concrete test in FIGURE 3.2.



**FIGURE 3.2**

- 3.2.1 Identify the type of test in FIGURE 3.2. (1)
- 3.2.2 Name TWO purposes of the test. (2 x 1) (2)
- 3.2.3 What is the diameter of the tamping rod? (1)
- 3.2.4 How many times should the mix be tamped with the rod? (1)
- 3.2.5 Where will this test be conducted? (1)

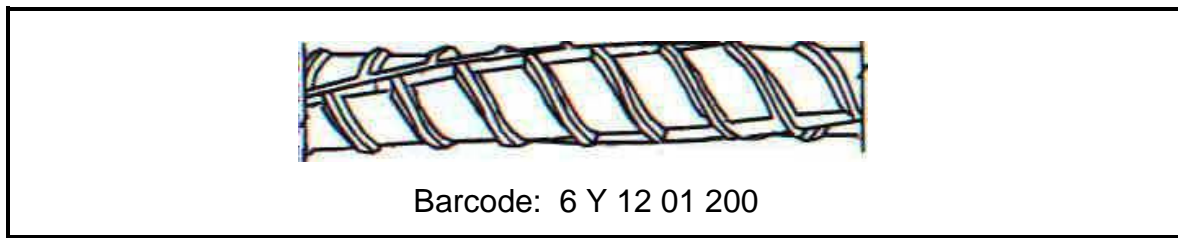
- 3.3 Describe the purpose of curing concrete. (3)
- 3.4 Name THREE methods for the curing of concrete. (3 x 1) (3)
- 3.5 Name THREE methods to make excavations safe at night. (3 x 1) (3)
- 3.6 Name FOUR causes for an excavation collapse. (4 x 1) (4)
- 3.7 Indicate whether the following statements are TRUE or FALSE.
- 3.7.1 Machinery must be at least 2 metres away from excavations. (1)
- 3.7.2 Trenches deeper than 1,5 m must be protected by bracing. (1)
- 3.7.3 Excavations must be inspected weekly. (1)
- 3.7.4 Ladders must be used to climb out of excavations. (1)
- 3.8 Name FOUR advantages of using pile foundations. (4 x 1) (4)
- 3.9 Name TWO types of foundations (pile /block foundation excluded). (2 x 1) (2)
- 3.10 FIGURE 3.10 shows a foundation strip of a storeroom.  
The foundation is 600 mm wide and 250 mm thick.  
Determine the centre line of the foundation strip.

**FIGURE 3.10**

(5)  
[40]

### QUESTION 4: REINFORCEMENT, FORMWORK, MATERIALS AND EQUIPMENT (SPECIFIC)

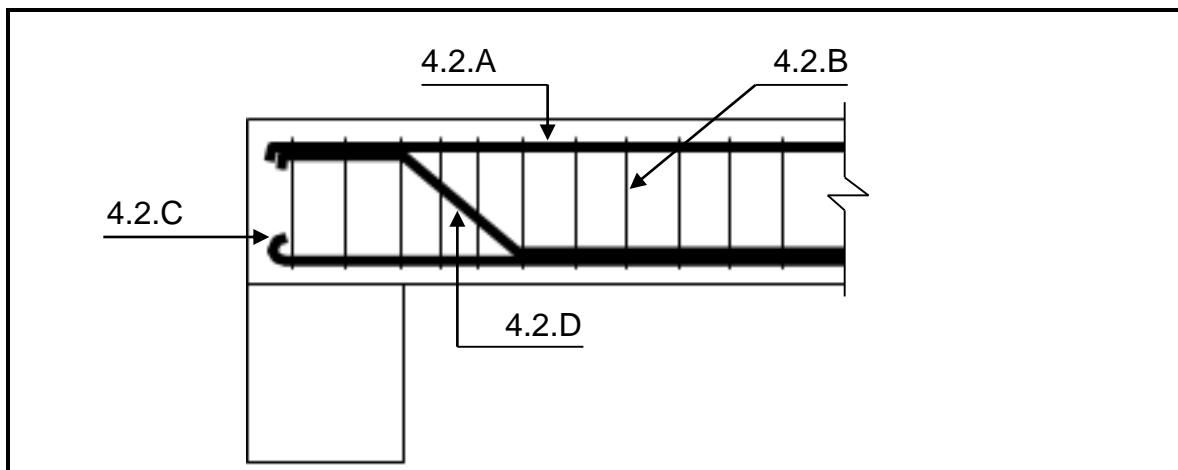
4.1 Answer the questions with regard to the bar (rod) code in FIGURE 4.1.



**FIGURE 4.1**

- 4.1.1 Name the type of steel. (1)
- 4.1.2 What is the heart (centre) spacing? (1)
- 4.1.3 How many bars (rods) will be used? (1)
- 4.1.4 What is the diameter size of the bars (rods)? (1)

4.2 Answer the questions in regard to the reinforced concrete beam in FIGURE 4.2.



**FIGURE 4.2**

- 4.2.1 Name the parts 4.2.A to 4.2.D. (4 x 1) (4)
- 4.2.2 Describe the purpose of part 4.2.B. (2)
- 4.3 Name the THREE forces that act on a concrete column. (3 x 1) (3)
- 4.4 Describe the purpose of the cover depth for reinforced concrete work. (2)
- 4.5 Name THREE materials that can be used for lining the formwork, to ensure a smoother finish. (3 x 1) (3)
- 4.6 Name TWO defects that can occur in concrete due to shuttering. (2 x 1) (2)



- 4.7 Name FOUR properties of good formwork. (4 x 1) (4)
- 4.8 Choose a description in COLUMN B that matches an item in COLUMN A. Write only the letter (A–K) next to the question (4.8.1–4.8.8) in the ANSWER BOOK, for example 4.8.1 N.

COLUMN A	COLUMN B
4.8.1 Boom pump	A hard, brittle and breaks easily
4.8.2 Perspex	B low toxicity
4.8.3 High strength concrete	C high volumes of concrete
4.8.4 Copper	D packing of equipment
4.8.5 Line (concrete) pump	E 20 MPa compressive strength
4.8.6 Cast iron	F silver colour
4.8.7 Silicone	G small volumes of concrete
4.8.8 Polystyrene	H metal dipped in molten zinc
	I 30 MPa compressive strength
	J used as awnings
	K high antibacterial properties

(8 x 1) (8)

- 4.9 Identify the metals as FERROUS or NON-FERROUS:

- 4.9.1 Aluminium (1)
- 4.9.2 Cast iron (1)
- 4.9.3 Lead (1)
- 4.9.4 Steel (1)
- 4.9.5 Brass (1)

4.10 Identify the following equipment:

4.10.1



**FIGURE 4.10.1**

(1)

4.10.2



**FIGURE 4.10.2**

(1)

4.10.3

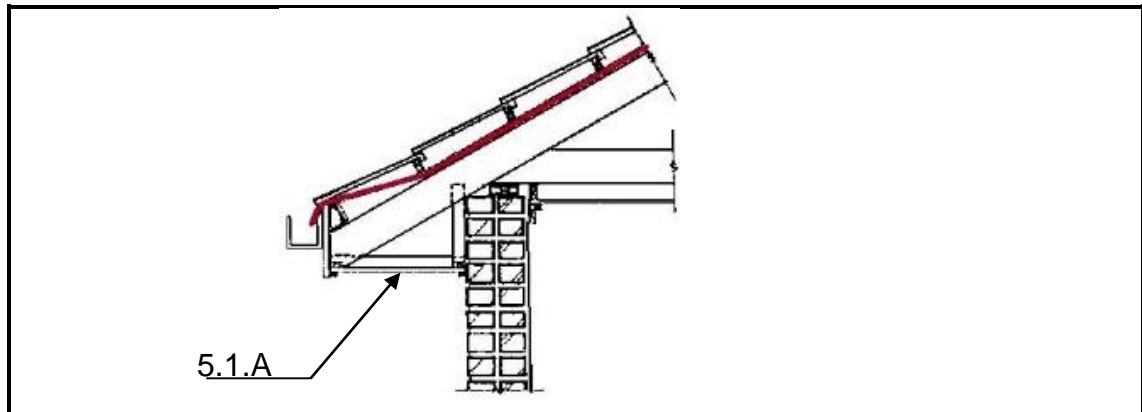


**FIGURE 4.10.3**

(1)  
[40]

**QUESTION 5: ROOFS, WALLS AND GRAPHICS (SPECIFIC)**

5.1 Answer the questions regarding the eave construction in FIGURE 5.1.

**FIGURE 5.1**

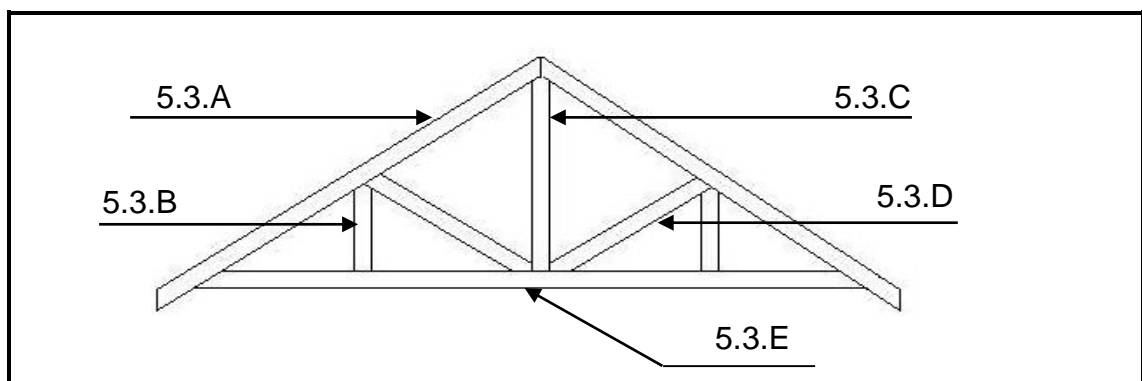
5.1.1 What type of eave construction is shown in FIGURE 5.1? (1)

5.1.2 Name TWO advantages of the eave in FIGURE 5.1. (2 x 1) (2)

5.1.3 Name TWO types of materials that can be used at 5.1.A. (2 x 1) (2)

5.2 Briefly discuss the purpose of beam filling. (3)

5.3 Name the parts 5.3.A to 5.3.E of the roof truss in FIGURE 5.3. (5 x 1) (5)

**FIGURE 5.3**

5.4 Answer the following questions on a cavity wall:

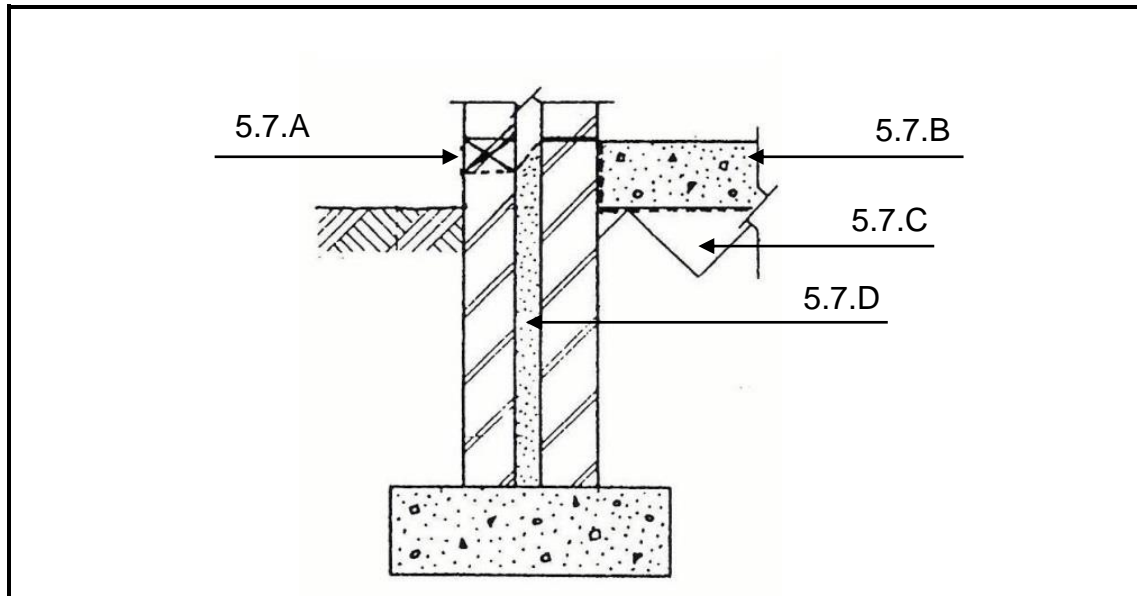
5.4.1 What is the measurement of the space between the walls (skins)? (1)

5.4.2 What is the maximum height for a cavity wall? (1)

5.5 Name THREE disadvantages of cavity walls. (3 x 1) (3)

5.6 Name TWO types of wall ties that can be used in cavity walls. (2 x 1) (2)

5.7 Name the parts 5.7.A to 5.7.D of the cavity wall in FIGURE 5.7. (4 x 1) (4)



**FIGURE 5.7**

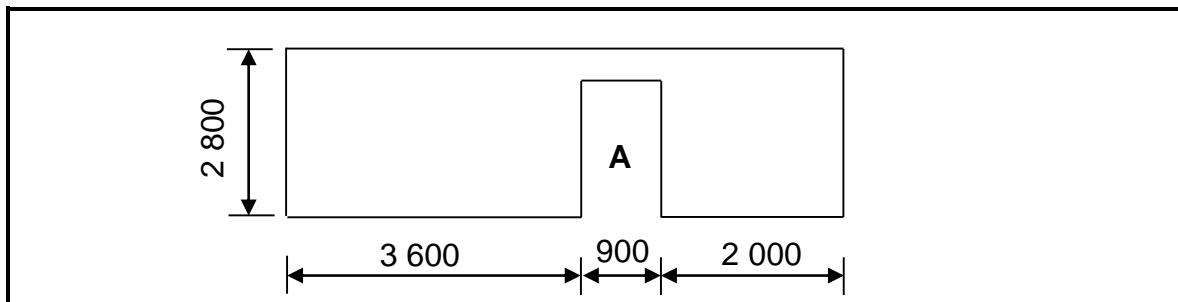
5.8 Use ANSWER SHEET B and draw an isometric view of a pier on a block foundation. Use the following information:

- Use own scale
- One-and-a-half brick pier
- Stretcher bond
- 5 Brick layers
- Block foundation

(6)  
**[30]**

**QUESTION 6: SCREEDS, STAIRS, BRICKWORK AND QUANTITIES (SPECIFIC)**

- 6.1 Name ONE type of sand that can be used as bedding sand for pavers. (1 x 1) (1)
- 6.2 Name FOUR advantages of mortar set pavers. (4 x 1) (4)
- 6.3 Indicate whether the following statements are TRUE or FALSE.
- 6.3.1 The centre brick in an arch is called the key stone. (1)
- 6.3.2 The minimum width of a staircase is 900 mm. (1)
- 6.3.3 Screed is a mixture of sand, cement and water. (1)
- 6.3.4 Screed is on average 50 mm thick. (1)
- 6.4 FIGURE 6.4 shows the front view of a joining wall between a house and a garage, with a door opening at A.  
The following measurements are applicable to the wall:  
Length = 6,5 m  
Wall height = 2,8 m  
Opening A = 0,9 m x 2,1 m  
Wall thickness = 220 mm  
Use the quantity list on ANSWER SHEET C and determine the amount of bricks needed for the wall. (12)

**FIGURE 6.4**

- 6.5 Name THREE types of materials that can be used for cladding. (3 x 1) (3)
- 6.6 Name TWO types of screeds. (2 x 1) (2)

6.7 Name the parts 6.7.A to 6.7.D of the staircase construction in FIGURE 6.7.

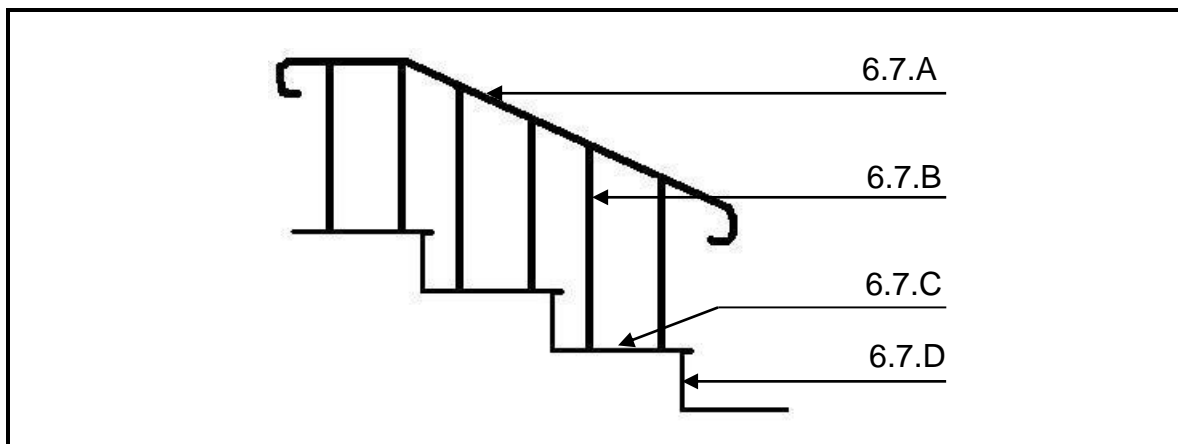


FIGURE 6.7

(4 x 1) (4)  
[30]

TOTAL: 200

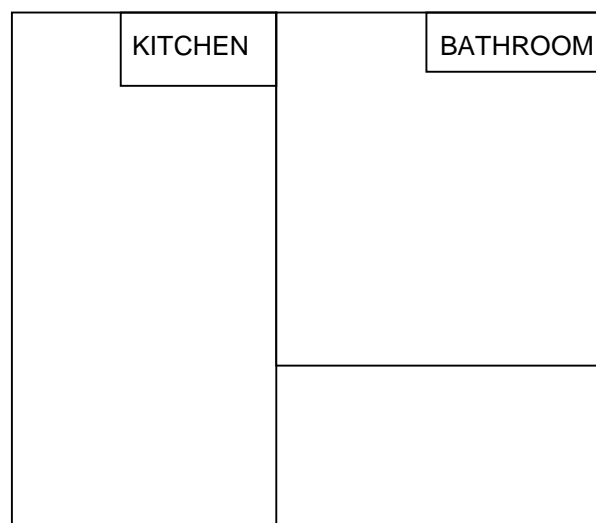
<b>ANSWER SHEET A</b>	<b>CIVIL TECHNOLOGY GENERIC</b>	<b>NAME:</b> _____

2.1 Use the information on ANSWER SHEET A and complete the site plan to scale 1 : 200.

ERF 121

ERF 123

ERF 125



PARLEMENT STREET

Site boundaries	2	
Building lines	2	
Site entrance	1	
Datum level	1	
Main sewerage	2	
Branch sewerage	2	
Manhole	2	
Rodding eyes	4	
Inspection eyes	4	
<b>TOTAL</b>	<b>20</b>	

<b>ANSWER SHEET    B</b>	<b>CIVIL TECHNOLOGY CONSTRUCTION</b>	<b>NAME:</b> _____

5.8 Use ANSWER SHEET B and draw an isometric view of a pier on a block foundation. Use own scale.

One-and-a-half brick pier	2	
Stretcher bond	1	
5 Brick layers	1	
Block foundation	2	
<b>TOTAL</b>	<b>6</b>	

PIER ON BLOCK FOUNDATION

ISOMETRIC VIEW



ANSWER SHEET <b>C</b>	CIVIL TECHNOLOGY CONSTRUCTION	NAME: _____

QUESTION 6.4			
A	B	C	D
			<b>Brick calculations:</b>
.....	.....		
	=====	=====	Total wall area
			<u>Bricks:</u>
.....	.....		
	=====	=====	Total number of bricks
			<u>Deductions:</u>
.....	.....		Opening A
	=====	=====	Total area
.....	.....		
	=====	=====	Total number of bricks for opening A
			<u>Total number of bricks needed:</u>
			..... - ..... = ..... bricks

(12)