Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2022

CIVIL TECHNOLOGY: CONSTRUCTION (DEAF)

MARKS: **200**

TIME: **3 hours**

This paper has 16 pages, including 2 answer sheets.

REQUIREMENTS:

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

INSTRUCTIONS AND INFORMATION

1. This question paper has 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.
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**(show)** your answers.
7. **Write ALL calculations** and answers in the ANSWER BOOK or on the attached ANSWER SHEETS.
8. **Use** the **mark allocation** to guide you 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**(fit in)** to the *SANS/SABS Code of Practice for Building Drawings.*
10. The size of a brick should be taken as 220 mm x 110 mm x 75 mm.
11. **Use** your own **discretion**(thinking) where dimensions and/or details have been omitted**(left out)**.
12. Answer **QUESTIONS 2.1** and **5.2** 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. **Drawings** in the question paper are **NOT to scale**.

QUESTION 1: SAFETY AND MATERIALS (GENERIC)

Start this question on a NEW **page**.

1.1 Define**(explain)** the term *accident*. (2)

1.2 **Name** the **material** that **scaffolding** is **made** from. (1)

1.3 **Choose** the **correct answer** between **brackets** that is related**(connected)** to scaffolding:

1.3.1 The **safety** factor that is **used** for **scaffolding frames** is (one / two / three). (1)

1.3.2 The **minimum thickness** of a **wooden scaffold platform** is (38 mm / 50 mm / 76 mm). (1)

1.3.3 The **minimum height** of a **suspended** scaffold is (900 mm / 1 200 mm / 1 500 mm). (1)

1.4 Give **TWO** reasons **why scaffolding** must be **inspected before** it can be **used**. (2 x 1) (2)

1.5 What is the **maximum distance** that a **suspended** scaffold may **hang over** the **edge** of the **structure**? (1)

1.6 What is the **maximum** height of a **trestle** scaffold? (1)

1.7 **Answer** the following **questions** with regard to **ladders**.

1.7.1 **Why** should **only one person** at a time **use** a **ladder**? (1)

1.7.2 **What** should the **end** of a **ladder** be **marked** with for **visibility** when it is **transported**? (1)

1.7.3 **Name ONE material** that **ladders** can be **made** from. (1)

1.7.4 **Why** should **ladders** be kept **clean** and **free** from **oil** and **grease**? (1)

1.8 Name **TWO advantages** of a **water**-**based paint**. (2 x 1) (2)

1.9 Name **TWO advantages** of the **curing** of **concrete**. (2 x 1) (2)

1.10 Name **TWO methods** that can be used to prevent the corrosion of metals. (2 x 1) (2)

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QUESTION 2: GRAPHICS, JOINING AND EQUIPMENT (GENERIC)

Start this question on a **NEW page**.

2.1 FIGURE 2.1 on ANSWER SHEET A **shows** the **outer lines** of a **structure** which must be **built** on a **site**. Draw the **site plan** on **scale 1** : 200 on ANSWER SHEET A so that the **structure** is in the **middle** of the **site**.

The **site plan** must comply **(in line)** with the following requirements.
Use the **points table** on SHEET A as reference.

2.1.1 Site size is 30 m wide from east to west and 40 m long from south to north. (2)

2.1.2 Pavement of 2 m and the street of 6 m on the south side. (3)

2.1.3 Building boundaries are 2 m on the east, north and west sides and 4 m on the south side. (4)

2.1.4 3 m wide entrance to the site. (2)

2.1.5 Datum level in the north-west corner of the site. (2)

Draw in the **sewer lay-out** for the **structure** and **show** the following:

2.1.6 Water closet symbol at the abbreviation (1)

2.1.7 Sewer pipes connections (2)

2.1.8 Rodding eye with the abbreviation (2)

2.1.9 Inspection eye with the abbreviation (2)

2.1.10 Manhole with the abbreviation (2)

Indicate**(show)** the following measurements:

2.1.11 Length and width of the site (4)

2.1.12 South and west building boundaries (2)

2.2 What is the advantage of the square shoulder bolt? (1)

2.3 Name parts **A** to **D** of the bolt in FIGURE 2.3.

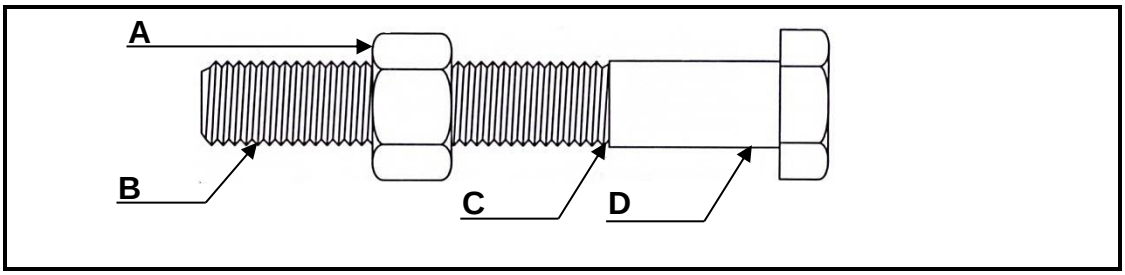

FIGURE 2.3

(4 x 1) (4)

2.4 **What** is the **purpose**(use) of the **nylon insert** of a **hexagonal nut**? (1)

2.5 **What** is the **advantage** of a **wing nut**? (1)

2.6 FIGURE 2.6 shows the **dumpy level reading** which is taken on the **telescopic staff**. **Answer** the following **questions** with regard to the reading.

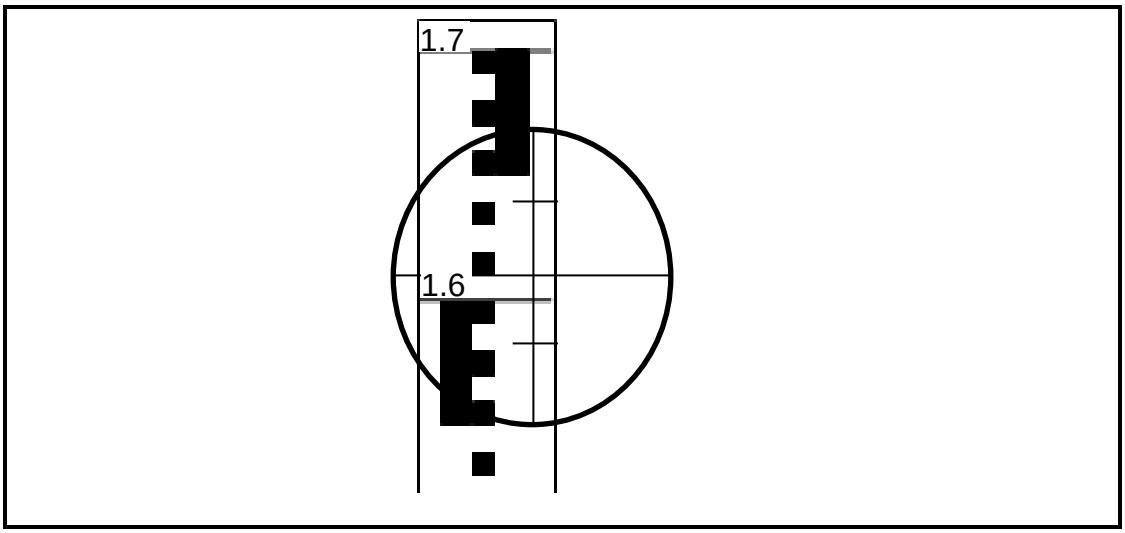

FIGURE 2.6

2.6.1 **What** is the **height** reading on the **staff**? (1)

2.6.2 **Determine** **(find out)** the distance between the dumpy level and the staff. Show ALL calculations, formulae and units. (4)

[40]

TOTAL SECTION A: 60

QUESTION 3: ROOFS, STAIRCASES AND JOINING (SPECIFIC)

Start this **question** on a **NEW page**.

3.1 **Name THREE advantages** for the **use** of **roof** underlays. (3 x 1) (3)

3.2 **Name TWO requirements** that **roof trusses** should **meet**. (2 x 1) (2)

3.3 **Answer** the following **question** with regard to **roof construction** in FIGURE 3.3.

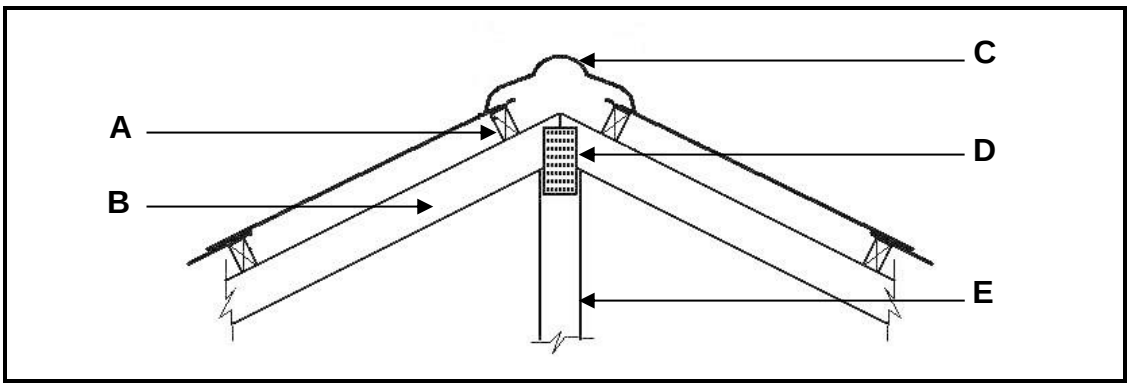

FIGURE 3.3

3.3.1 **Name** parts **A** to **E**. (5 x 1) (5)

3.3.2 **What** are the **measurements** (sizes) of **parts B** and **E**? (2 x 1) (2)

3.3.3 **What** is the **purpose** (**function**) of part **D**? (1)

3.4 **Choose** the **correct** answer from the **words** given in **brackets** in the following statements:

3.4.1 The **pitch** of **flat roofs** are **less** than (10° / 20° / 30°). (1)

3.4.2 The **maximum centre**-to-**centre spacing** of **battens(boards)** are (245 mm / 345 mm / 445 mm). (1)

3.4.3 The **minimum** pitch**(field)** for corrugated iron sheets are (5° / 10° / 15°). (1)

3.5 **Provide(give)** the **MEASUREMENT** at the **following descriptions** of stairs:

3.5.1 The **minimum depth** of the **tread** (1)

3.5.2 The **maximum vertical** increase of a **staircase** between landings (1)

3.5.3 The **maximum pitch** of stairs for **private use** (1)

3.5.4 The **maximum rise** of a **stair** (1)

3.6 **Provide(give)** ONE **term** for the following **descriptions** of **staircases**:

3.6.1 The horizontal distance covered by the **stairs**. (1)

3.6.2 The **overhang** at the **front** of the **tread(step)**. (1)

3.6.3 The **vertical** member **between** two **consecutive treads(steps)**. (1)

3.7 **Name** TWO types of materials that staircases can be made from. (2 x 1) (2)

3.8 **Identify(tell)** the following statements as **TRUE** or **FALSE**:

3.8.1 The **wall plate fixes(repairs)** the **roof truss** to the **wall**. (1)

3.8.2 **Galvanized steel straps** must be to a **depth** of **600** mm in the **wall** for light roofs, if the **wall** is built from **hollow concrete blocks**. (1)

3.8.3 **Wall ties** must be able to **resist(fight) compressive** stresses. (1)

3.9 **Name** TWO **types** of **cast**-in **bolt anchors**. (2 x 1) (2)

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QUESTION 4: MATERIAL, EQUIPMENT AND TOOLS, EXCAVATIONS AND FOUNDATIONS (SPECIFIC)

Start this question on a NEW page.

4.1 **Choose** a **description** from **COLUMN** B that **fits** best with the **item** in **COLUMN** A. Write only the letter (A–I) next to the question numbers (4.1.1 to 4.1.6) in the ANSWER BOOK, for example 4.1.7 K.

COLUMN A		COLUMN B	
4.1.1	Aluminium	A	heavy metal
4.1.2	Silicone	B	dipped in molten zinc
4.1.3	Ductile cast iron	C	tested in a laboratory
4.1.4	Perspex	D	light metal
4.1.5	Cube test	E	basic sealant
4.1.6	Polystyrene	F	tested on the site
		G	packaging material
		H	alternative for glass
		I	highly toxic

(6 x 1) (6)

4.2 **Name** TWO **methods** to **pump concrete** to **higher levels** in a building. (2 x 1) (2)

4.3 **What** is the **compressive strength** in **MPa** of **high-strength concrete**? (1)

4.4 **Name** ONE **disadvantage** of **ready-mix concrete**. (1)

4.5 **Name** FOUR **types** of **apparatus used** for the **slump test**. (4 x 1) (4)

4.6 **Discuss** the **purposes(uses)** of the **cube test**. (2 x 1) (2)

4.7 **How many** cube samples**(examples)** is required**(needed)** for the **cube test** in a **laboratory**? (1)

4.8 **Draw** a **neat sketch** of a normal **failure** of the **cube test** in the **ANSWER BOOK**. (2)

4.9 **Name** the **TWO main** groups into which **metals** can be **classified(grouped).** (2 x 1) (2)

4.10 **Name** TWO **types** of **material** that can be **used** for the **cladding(covering)** of buildings. (2 x 1) (2)

4.11 **Answer** the **questions** with regard to the **construction machine** in FIGURE 4.11.

FIGURE 4.11

4.11.1 Is this **machine used** for **light** or **heavy compaction** of **soil**? (1)

4.11.2 **Name** TWO **methods** of **maintaining(keeping)** the **machine**. (2 x 1) (2)

4.12 **Identify(name)** the **construction** machines in **FIGURES** 4.**12A** and 4.12B. (2 x 1) (2)

FIGURE 4.12A

FIGURE 4.12B

4.13 Name **TWO factors** that can **influence** the **design(plan)** of a building and the **excavation(diggings)** thereof. (2 x 1) (2)

4.14 **Name** FOUR **causes** for the **collapse** of an **excavation(diggings)**. (4 x 1) (4)

4.15 **Identify(state)** the following **statements** as TRUE or FALSE:

4.15.1 **Red** or **orange warning lights** are used **excavations(diggings)**. (1)

4.15.2 The **fencing around** the **perimeter** of the **excavation(digging) site(place)** must be at least **two meters high**. (1)

4.15.3 **Ropes** may be **used** to **exit** deep **trenches(holes)**. (1)

4.16 Name THREE types of foundations. (3 x 1) (3)

[40]

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

Start this question on a NEW page.

5.1 **Answer** the **questions** with **regard** to the **wall** in FIGURE 5.1.

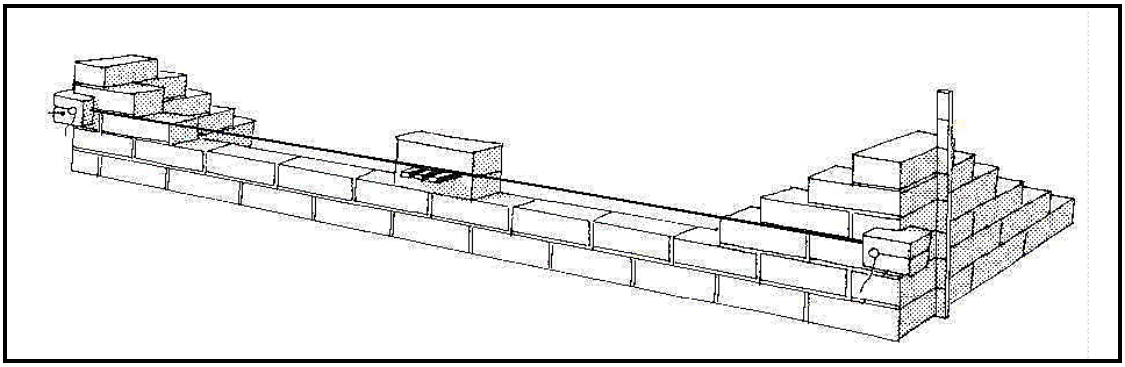


FIGURE 5.1

5.1.1 What **type** of **bond** was **used** to **build** this **wall**? (1)

5.1.2 Is this a **half brick wall** or a **one brick wall**? (1)

5.1.3 **What** is the **width** of the **wall**? (1)

5.2 **Draw** in the **damp-proof course** (DPC) at **wall** and **floor** on ANSWER SHEET B. (5 x 1) (5)

5.3 **Answer** the **questions** with regard to the **cavity wall**.

5.3.1 **What** is the **width** of a **standard cavity wall**? (1)

5.3.2 How **thick** should the **skins** (**leaves**) at least **be**? (1)

5.3.3 **What** is the **maximum height** of a **cavity wall**? (1)

5.3.4 **What connects** the **two skins**? (1)

5.3.5 **What** is the **purpose(use)** of the **weep(leak) hole**? (1)

5.4 **Name** THREE **advantages** of **cavity walls**. (3 x 1) (3)

5.5 **Identify(name)** the **wall** ties in FIGURES 5.5A and 5.5B. (2 x 1) (2)

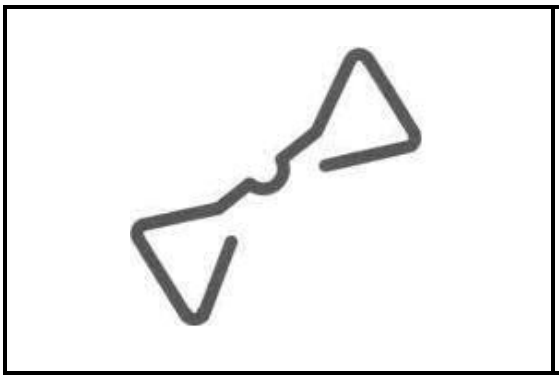


FIGURE 5.5A

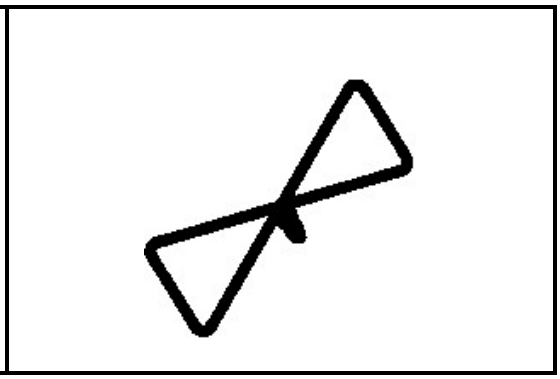


FIGURE 5.5B

5.6 **Choose** a **description** from COLUMN B that **fits** with the **item** in COLUMN A. Write only the letter (A–F) next to the question numbers (5.6.1 to 5.6.4) in the ANSWER BOOK, for example 5.6.5 G.

COLUMN A		COLUMN B	
5.6.1	Su-base	A	natural soil on which the paving will be laid
5.6.2	Kerb	B	sand used as grouting between paving blocks
5.6.3	Subgrade	C	best edge restraint for paving
5.6.4	Bedding sand	D	final layer upon which paving is laid
		E	preparation of the su-base
		F	prepared layer beneath paving and bedding sand

(4 x 1) (4)

5.7 **Name** TWO **advantages** of **mortar**-**set paving**. (2 x 1) (2)

5.8 **Name** TWO **reasons** for **construction failure** of **paving**. (2 x 1) (2)

5.9 **Draw** a **neat sketch** with **EIGHT** (8) **bricks** of the **basket**-**weave** paving **pattern** in the ANSWER BOOK. **Use** your **own scale**. (4)

5.10 **Answer** the **questions** with regard to the **arch** in FIGURE 5.10.

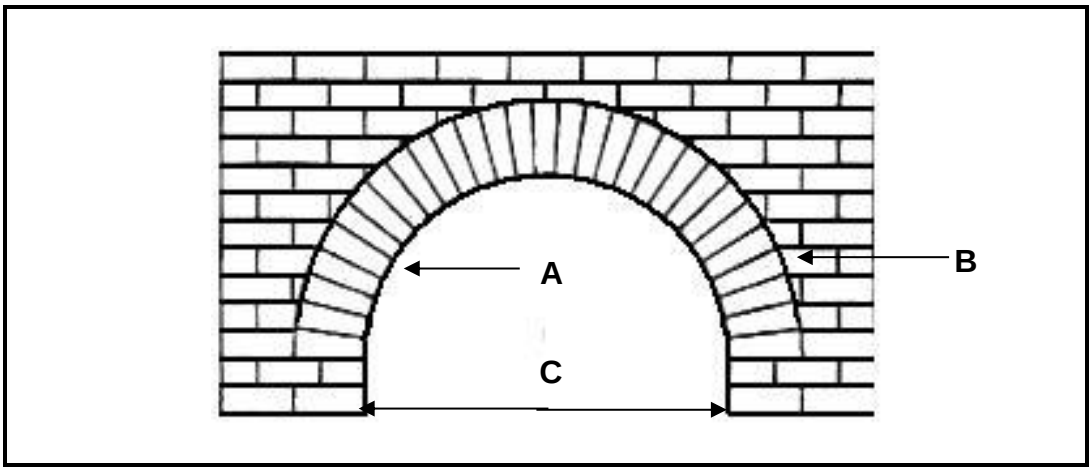


FIGURE 5.10

5.10.1 **Identify**$_{(name)}$ this **type** of **arch construction**. (1)

5.10.2 **Name** parts **A** to **C**. (3 x 1) (3)

5.11 **Name** the **ingredients** of **plaster** (**water and lime excluded**). (2 x 1) (2)

5.12 **Name TWO types** of **plaster finishes**. (2 x 1) (2)

5.13 **Name** TWO **types** of **screed layers**. (2 x 1) (2)

[40]

QUESTION 6: FORMWORK, REINFORCING, CONCRETE FLOORS AND QUANTITIES (SPECIFIC)

Begin this **question** on a **NEW page**.

6.1 **Define** the term ***in-situ concrete***. (1)

6.2 **Name** THREE **properties** of **good formwork**. (3 x 1) (3)

6.3 **Answer** the **questions** with regard to the **formwork** in FIGURE 6.3.

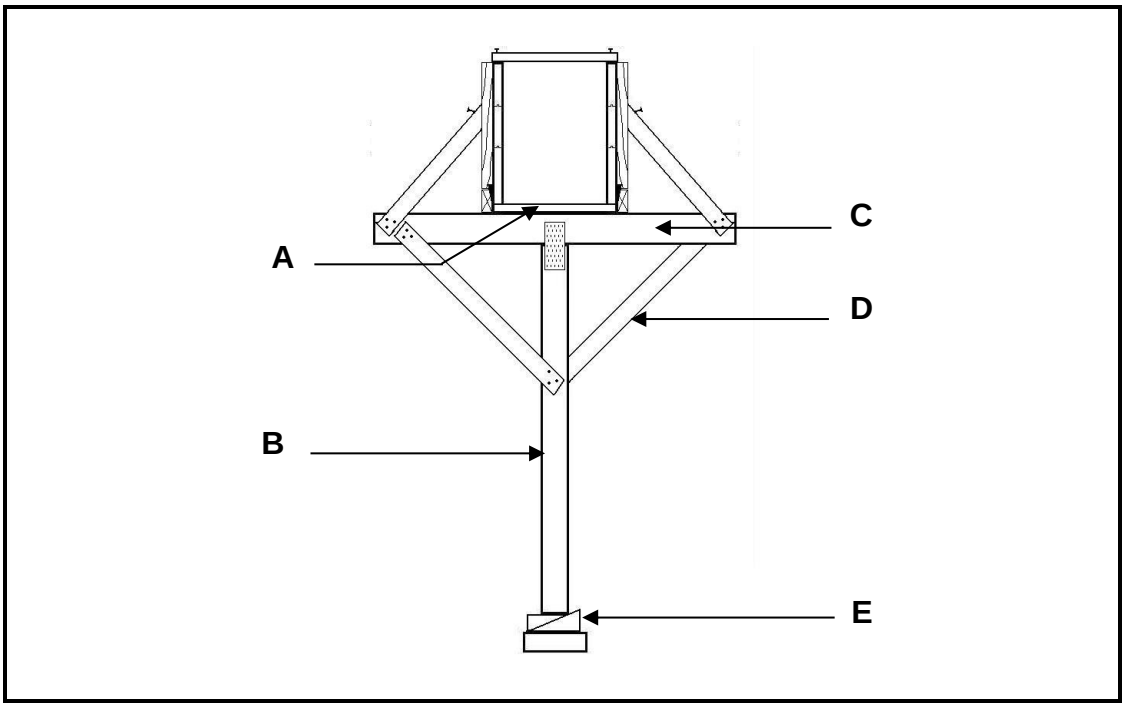


FIGURE 6.3

6.3.1 **Name parts A** to **E**. (5 x 1) (5)

6.3.2 **Is** this **formwork used** for a **column** or a **beam**? (1)

6.4 **Answer** the **questions** with regard to the **bar code** in FIGURE 6.4.

Bar code: **8Y12-01-200**

FIGURE 6.4

6.4.1 What **type** of **steel** is **used**? (1)

6.4.2 What is the **diameter** of the **bars**? (1)

6.4.3 What is the **spacing** of the **bars**? (1)

6.5 Draw a neat side view of the rib-and-block construction in the ANSWER BOOK. Show with an arrow the parts (rib and block). (6)

6.6 **Name** ONE **purpose(use)** of the **cover depth** at the **reinforcing(strengthening)** of **concrete work**. (1)

6.7 **Name** ONE **method** of **joining steel** bars. (1)

6.8 FIGURE 6.8 **shows** the **outside measurements** of a store-**room**.
The foundation is 700 mm wide and 250 mm thick.
Answer the **questions** in the ANSWER BOOK.
Table format is **NOT required(needed)** (show all formulas and steps).

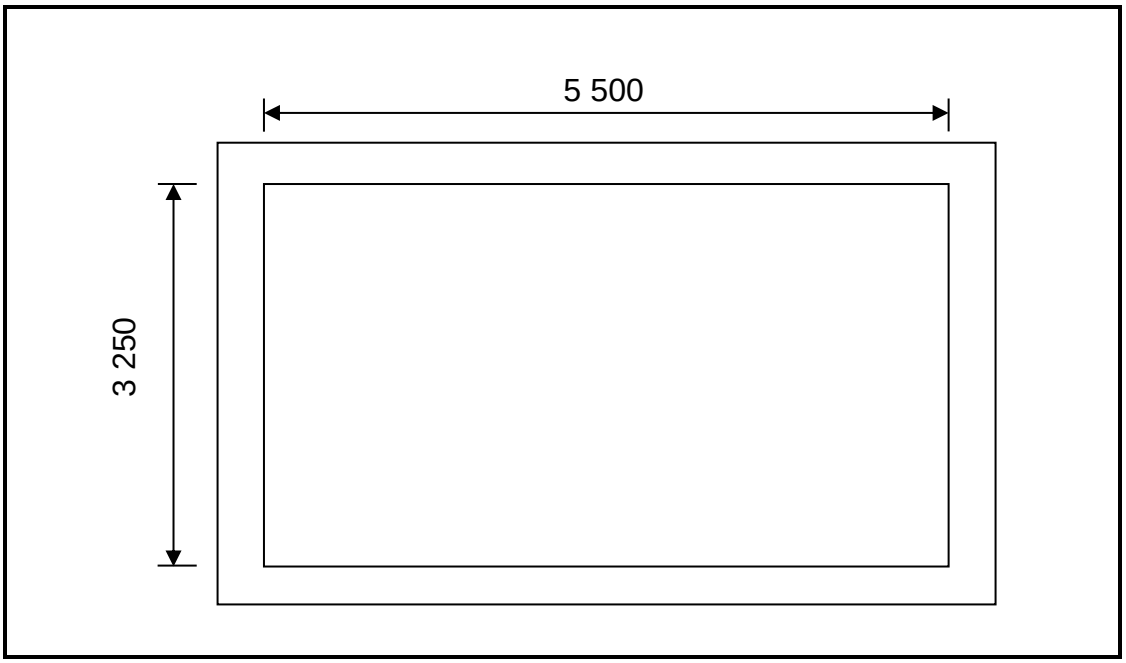


FIGURE 6.8

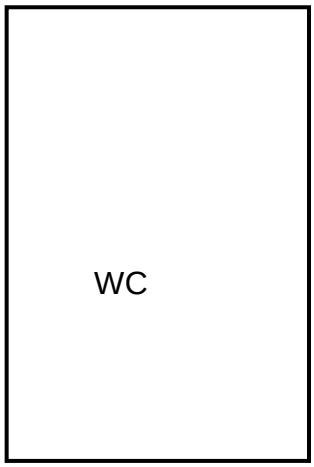
6.8.1 Calculate the centre line of the foundation. (5)

6.8.2 **Calculate** the **volume** of **concrete required(needed).** (4)
[30]

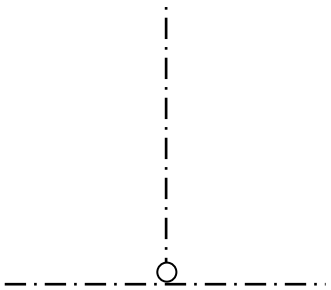
TOTAL: 200

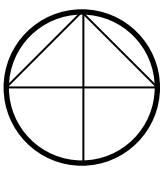
ANSWER SHEET **A**	**CIVIL TECHNOLOGY GENERIC**	**NAME:** _____

2.1 FIGURE 2.1 on ANSWER SHEET A **shows** the **outer lines** of a **structure** which must be **built** on a site**(place)**. **Draw** the **site plan** on scale 1 : 200 on ANSWER SHEET A so that the **structure** is in the **middle** of the **site**. (28)



Plot size	2	
Pavement + street	3	
Building boundaries	4	
Entrance	2	
Datum level	2	
Water closet	1	
Sewer connection	2	
Inspection eye + abbr.	2	
Rodding eye + abbr.	2	
Manhole + abbr.	2	
Measurements	6	
TOTAL	**28**	





ANSWER SHEET **B**	CIVIL TECHNOLOGY CONSTRUCTION	NAME: _____

5.2 **Draw** in the **damp-proof course** (DPC). (5)