



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**SEPTEMBER 2018**

**CIVIL TECHNOLOGY: CIVIL SERVICES**

**MARKS: 200**

**TIME: 3 hours**



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This question paper consists of 15 pages, including 4 answer sheets.

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**REQUIREMENTS:**

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

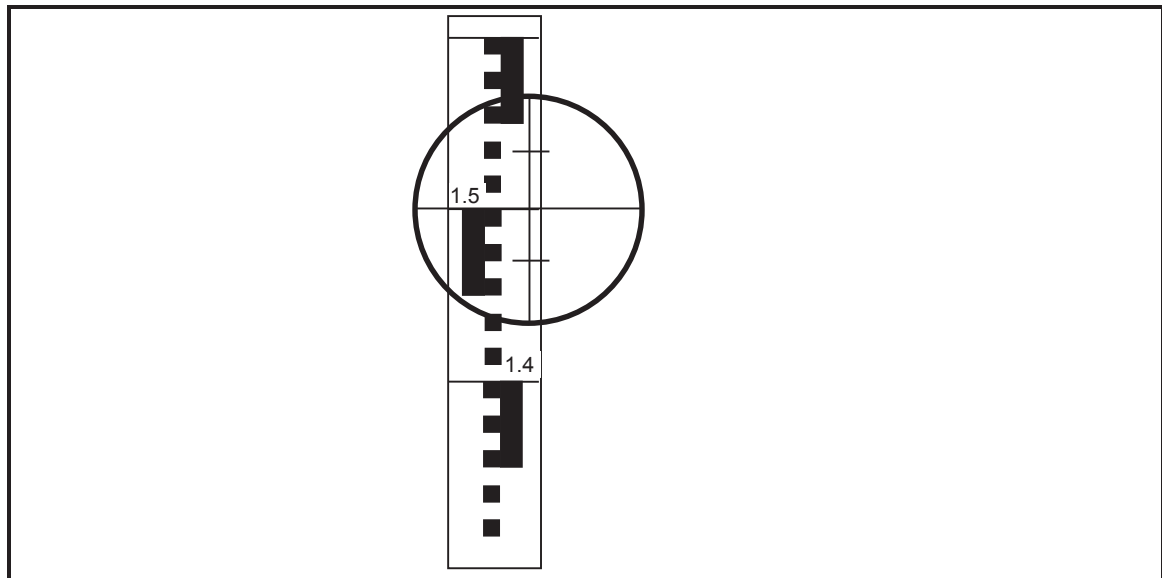
**INSTRUCTIONS AND INFORMATION**

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, 3.10, 5.1 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.
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]**

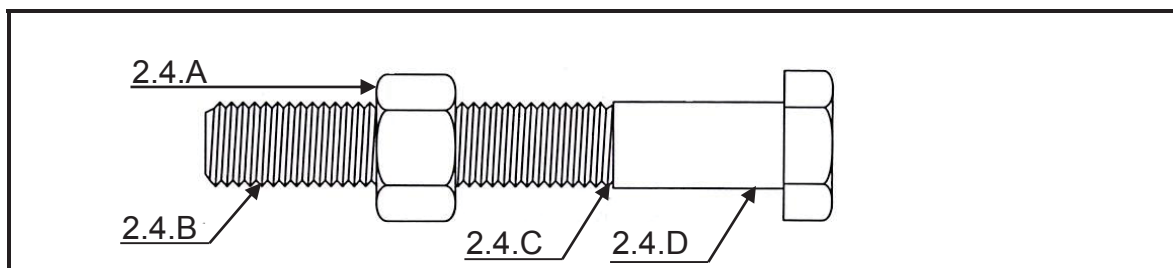
**QUESTION 2: GRAPHICS AND JOINING (GENERIC)**

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: SAFETY, MATERIAL, EQUIPMENT AND GRAPHICS (SPECIFIC)**

Start this question on a NEW page.

- 3.1 Briefly motivate why the area around a manhole must be secured before workers enter. (2)
- 3.2 Study the following safety requirements with regard to openings and supply the omitted word. Write only the answer next to the question number in your ANSWER BOOK.
- 3.2.1 Safety signage must be displayed at all ... and floors that have no rails. (1)
- 3.2.2 A ... or catch platform must be positioned above an opening where people are working to prevent falling objects from injuring workers. (1)
- 3.2.3 Manholes must have a ... for safety. (1)
- 3.3 Describe ONE responsibility of the contractor which is required by Regulation 10 of the Construction Regulations when working in elevated positions. (1 x 3) (3)
- 3.4 Briefly describe what dezincification of an alloy is. (2)
- 3.5 Name ONE consequence of dezincification when it occurs in an alloy. (1 x 1) (1)
- 3.6 How are signs of dezincification recognised on metal surfaces? (1)
- 3.7 Describe TWO methods of preventing corrosion in metals. (2 x 2) (4)
- 3.8 Answer the following questions with regard to the tool in FIGURE 3.8.



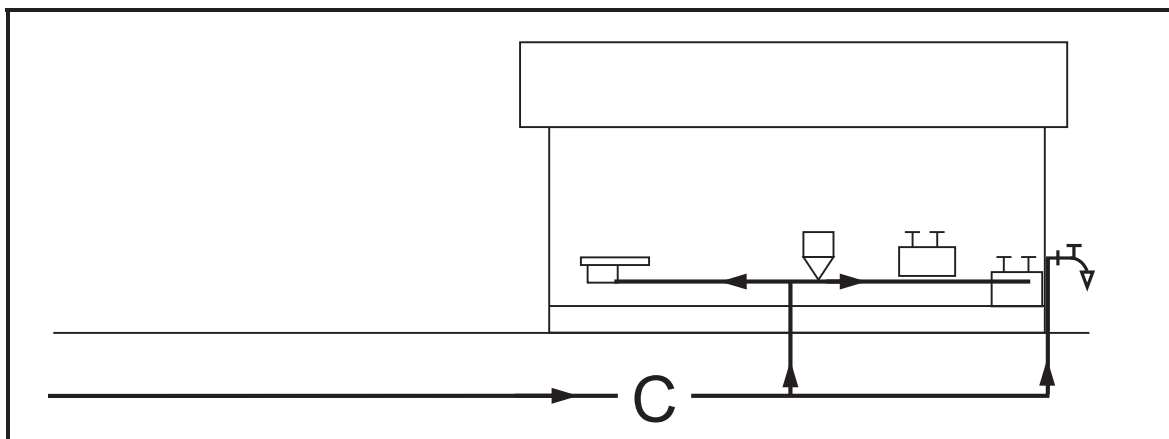
**FIGURE 3.8**

- 3.8.1 What is this tool called? (1)
- 3.8.2 What is part 3.8.A called? (1)
- 3.8.3 Describe the cleaning process of part 3.8.A. (3)
- 3.9 Which tool will be used for the following work?
- 3.9.1 To move liquids through pipes (1)
- 3.9.2 To cut thread in pipes (1)
- 3.9.3 To identify leakages in pipe systems (1)
- 3.10 FIGURE 3.10 on ANSWER SHEET B shows a square-based truncated pyramid. Draw on ANSWER SHEET B the pattern development for the pyramid. (16)

**[40]**

**QUESTION 4: QUANTITIES AND JOINING (SPECIFIC)**

- 4.1 FIGURE 4.1 shows the front elevation of the cold-water supply from the water meter to a house on scale 1 mm = 100 mm. The main cold-water pipe has a diameter of 22 mm and the branch pipes have a diameter of 15 mm. Study the drawing and determine the material needed for the plumbing installation by completing the table.

**FIGURE 4.1**

WATER SUPPLY APPLIANCES	MATERIAL	SIZE	QUANTITY	LENGTH
Cold-water pipe	<b>4.1.1</b>	22 mm	1	<b>4.1.2</b>
Cold-water pipe	<b>4.1.3</b>	15 mm	1	<b>4.1.4</b>
Reducing elbow 90°	<b>4.1.5</b>	22 mm x 15 mm	<b>4.1.6</b>	
Elbow 90°	<b>4.1.7</b>	15 mm	<b>4.1.8</b>	
Reducing tee	<b>4.1.9</b>	22 mm x 22 mm x 15 mm	<b>4.1.10</b>	
Tee	<b>4.1.11</b>	15 mm x 15 mm	<b>4.1.12</b>	

(12)

- 4.2 Give a short description of the following sewerage terminology:

4.2.1 Branch pipe (2)

4.2.2 Cleaning eye (2)

4.2.3 Soil water (2)

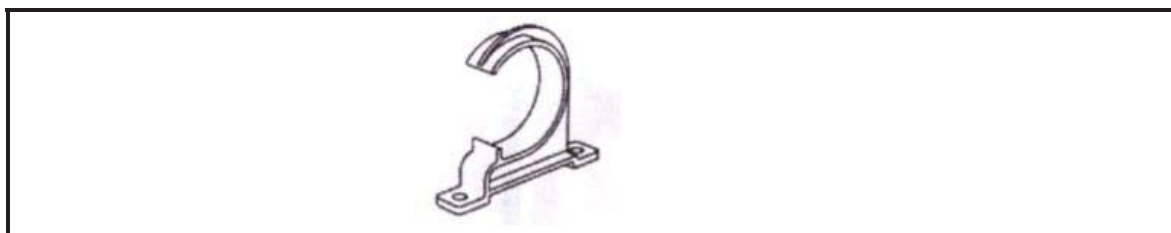
- 4.3 In which colour code are the following sewerage pipes indicated on house plans?

4.3.1 Soil pipe (1)

4.3.2 Soil-water vent pipe (1)

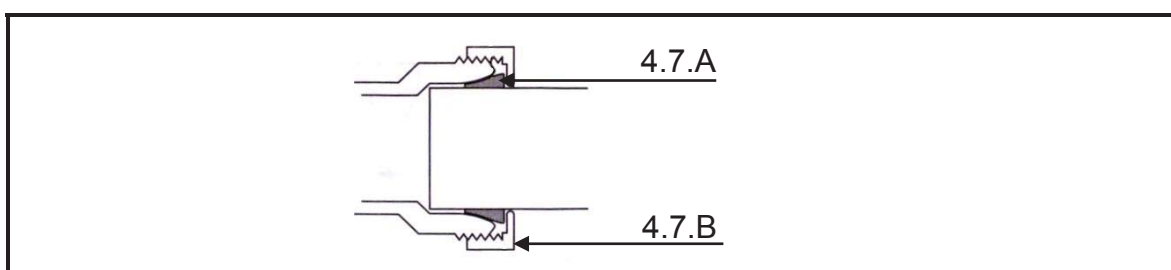
4.3.3 Existing sewerage (1)

4.4 Answer the following questions with regard to the pipe fitting in FIGURE 4.4.



**FIGURE 4.4**

- 4.4.1 What is this pipe fitting called? (1)
- 4.4.2 In which TWO sizes is this fitting manufactured? (2)
- 4.4.3 Briefly describe the purpose of this fitting. (2)
- 4.5 A cylindrical water tank is 2 400 mm high and has a diameter of 2 100 mm. Calculate the volume of the tank. Indicate all calculations, formulae and units. (4)
- 4.6 Indicate whether the following statements are TRUE or FALSE. Write only the word 'true' or 'false' next to the number in the ANSWER BOOK.
- 4.6.1 The teeth of a hacksaw face forward. (1)
- 4.6.2 A pipe cutter can be used to cut galvanised pipes. (1)
- 4.6.3 The burr of a cut pipe must be removed with a hacksaw. (1)
- 4.6.4 uPVC pipes are joined with flange joints. (1)
- 4.7 Answer the following questions with regard to the fitting in FIGURE 4.7.



**FIGURE 4.7**

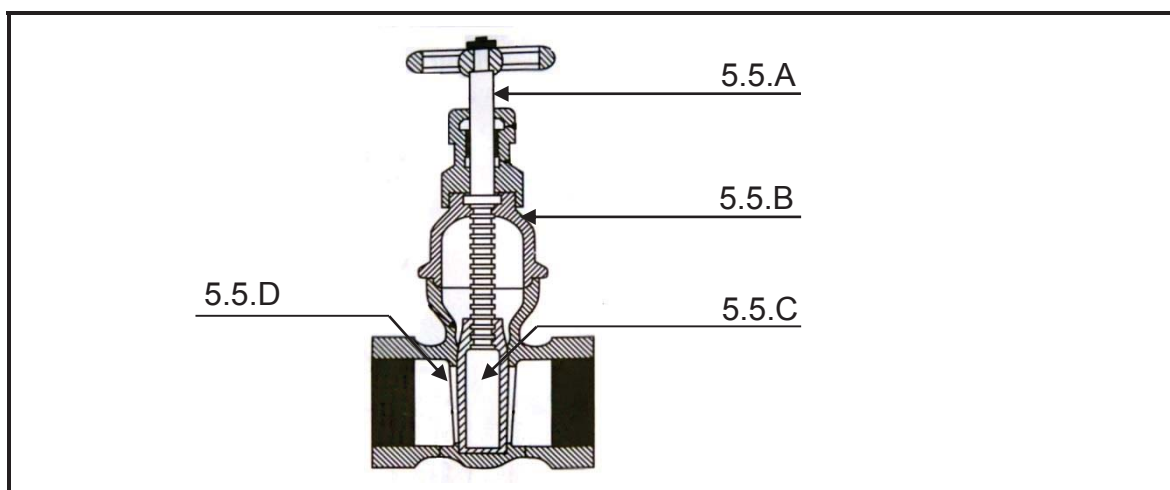
- 4.7.1 What is this fitting called? (1)
- 4.7.2 Identify the parts 4.7.A and 4.7.B. (2)
- 4.7.3 Which type of pipe is joined to these fittings? (1)
- 4.8 Briefly describe the meaning of the tinning of a soldering iron. (2)

**[40]**



### QUESTION 5: CONSTRUCTION, COLD-WATER AND HOT-WATER SUPPLY (SPECIFIC)

- 5.1 FIGURE 5.1 on ANSWER SHEET C shows layer 1 of a double return angle in a one-brick wall in stretcher bond. Draw in good ratio on ANSWER SHEET C the alternative layer for the brick wall. (6)
- 5.2 FIGURE 5.2 on ANSWER SHEET D shows the incomplete top view of a concrete manhole. Complete in good ratio the branch connection and pipe work in the manhole. (3)
- 5.3 Name TWO reasons why the concrete benching in a manhole is constructed at a slope. (2 x 1) (2)
- 5.4 Describe TWO positions where manholes must be installed. (2 x 2) (4)
- 5.5 Answer the following questions with regard to the valve in FIGURE 5.5.



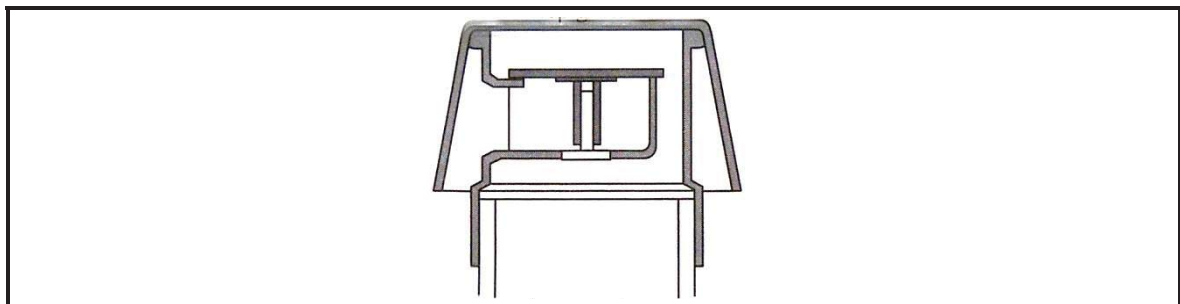
**FIGURE 5.5**

- 5.5.1 What is this valve called? (1)
- 5.5.2 Name the parts 5.5.A to 5.5.D. (4 x 1) (4)
- 5.5.3 Name TWO positions where this type of valve must be installed. (2 x 1) (2)
- 5.6 Briefly describe the purpose of vacuum breakers at a geyser. (2)
- 5.7 Identify the correct answer between brackets with regard to the following descriptions:
- 5.7.1 A drip tray is installed under a (bath / geyser). (1)
- 5.7.2 The thermostat controls the (water pressure / heating) in a geyser. (1)
- 5.7.3 Solar geysers are installed at the (eastern side/northern side) of a building. (1)
- 5.8 Briefly describe how an airlock occurs in a hot water system. (3)

**[30]**

**QUESTION 6: ROOFING, STORM WATER, DRAINAGE AND SANITARY APPLIANCES (SPECIFIC)**

- 6.1 What is the standard slope of a gutter? (1)
- 6.2 With what are gutters fixed to fascia boards? (1)
- 6.3 Briefly describe the purpose of surface channels in a stormwater system. (2)
- 6.4 How far from a building are stormwater soakaways constructed? (1)
- 6.5 Describe the requirements which are applicable to the following facets of drainage systems:
- 6.5.1 Inside of pipes (1)
  - 6.5.2 Joints in pipes (1)
  - 6.5.3 Sharp bendings (1)
  - 6.5.4 Minimum diameter of pipes (1)
  - 6.5.5 Height of vent pipes (1)
- 6.6 Briefly describe the difference between *waste water* and *soil water*. (2)
- 6.7 Answer the following questions with regard to the drainage fitment in FIGURE 6.7.

**FIGURE 6.7**

- 6.7.1 What is this fitment called? (1)
- 6.7.2 Describe the functioning and purpose of this fitment when waste water is released into a drainage system. (4)
- 6.8 Why must French drains not be excavated close to boreholes? (1)
- 6.9 Name TWO causes of blockages in main sewer pipes. (2 x 1) (2)
- 6.10 What is the minimum internal pressure that sewer pipes must resist? (1)

6.11 Name TWO properties of each of the following materials for sanitary fitments:

6.11.1 Ceramic (2 x 1) (2)

6.11.2 Stainless steel (2 x 1) (2)

6.12 Choose a dimension from COLUMN B that matches a term in COLUMN A.  
Write only the letter (A–H) next to the question number (6.12.1–6.12.5) in the  
ANSWER BOOK, for example 6.12.6 J.

COLUMN A		COLUMN B	
6.12.1	Sewer pipe size	A	22 mm
6.12.2	Washbasin height above floor level	B	45 mm
6.12.3	Washbasin water supply pipes	C	950 mm
6.12.4	Washbasin waste pipe	D	12 mm
6.12.5	Bathwater supply pipes	E	15 mm
		F	100 mm
		G	32 mm
		H	800 mm

(5 x 1) (5)  
[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



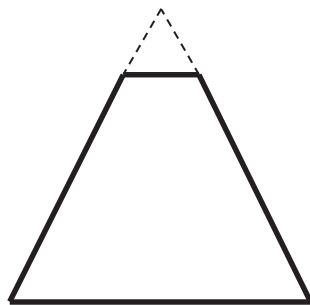
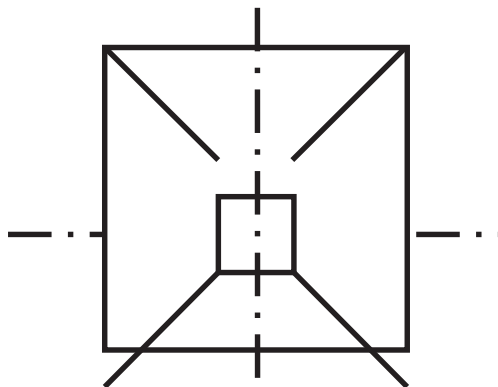
PARLEMENT STREET

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 CIVIL SERVICES</b>	<b>NAME:</b> _____

- 3.10 FIGURE 3.10 on ANSWER SHEET B shows a square-based truncated pyramid. Draw on ANSWER SHEET B the pattern development for the pyramid.

**SIDE VIEW****TOP VIEW**

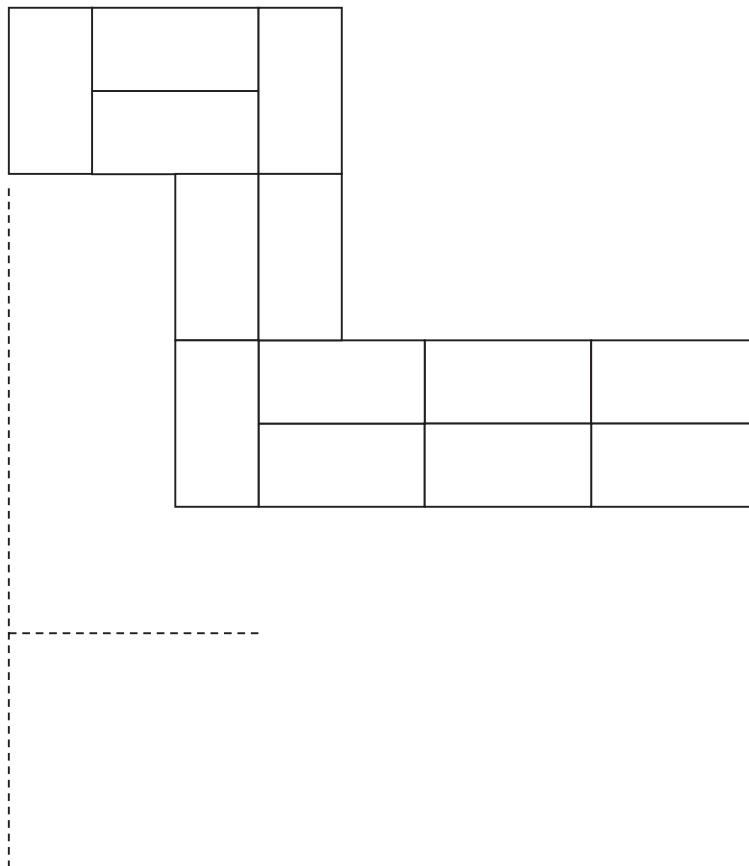
Construction lines	3	
Arc lines	2	
Base points	6	
Seam lines	1	
Side lines	2	
Accuracy + neatness	2	
<b>TOTAL</b>	<b>16</b>	





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

- 5.1 FIGURE 5.1 on ANSWER SHEET C shows layer 1 of a double return angle in a one-brick wall in stretcher bond. Draw in good ratio on ANSWER SHEET C the alternative layer of the brick wall.

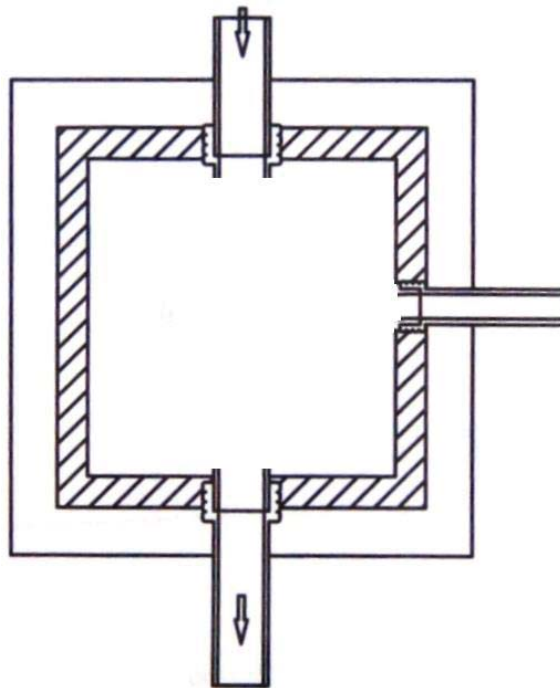


(6)



<b>ANSWER SHEET     D</b>	<b>CIVIL TECHNOLOGY CIVIL SERVICES</b>	<b>NAME:</b> _____
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- 5.2     FIGURE 5.2 on ANSWER SHEET D shows the incomplete top view of a concrete manhole. Complete in good ratio the branch connection and pipe work in the manhole.



(3)

