



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

SEPTEMBER 2013

CIVIL TECHNOLOGY

MARKS: 200

TIME: 3 hours



This question paper consists of 13 pages.

REQUIREMENTS:

1. Drawing instruments
2. A non-programmable calculator

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX questions.
2. ALL questions are COMPULSORY.
3. Answer each question as a whole. DO NOT separate sub-questions.
4. Start each question on a NEW page.
5. Sketches may be used to illustrate your answers.
6. ALL calculations and written answers must be done in the answer book.
7. Drawings and sketches must be fully dimensioned and neatly finished off with titles and labels to conform to SANS (SABS) Recommended Practice for Building Drawings.
8. For the purpose of this examination, the size of a brick should be taken as 220 mm x 110 mm x 75 mm.
9. Use your discretion where dimensions and/or details have been omitted.
10. Non-programmable pocket calculators may be used.
11. Answer QUESTION 5.1 and QUESTION 6 on the answer sheets provided, using drawing instruments where necessary.

QUESTION 1: CONSTRUCTION PROCESSES

- 1.1 As a carpenter it is your task to install a door into a door frame. One of the tools you will use is a portable power drill. Name FOUR safety precautions you will observe while using the power drill. (4)
- 1.2 A wall plate must be lengthened. What type of joint would you use to join the wall plate? (1)
- 1.3 Scaffolding is commonly used on a building site.
- 1.3.1 Define the term *scaffolding*. (2)
- 1.3.2 Name TWO types of scaffolding. (2)
- 1.3.3 What part of scaffolding will prevent it from sinking into the ground? (1)
- 1.3.4 Name FIVE safety precautions to be observed when erecting scaffolding. (5)
- 1.4 Name TWO joining methods that can be used to join corrugated iron roof sheets to purlins. (2)
- 1.5 Explain why it is important that roof trusses should be braced. (4)
- 1.6 Explain how you will stop excessive bleeding of a limb. (2)
- 1.7 Name THREE groups of preservatives for wood. (3)
- 1.8 Name THREE elements that must be present for a fire to exist. (3)
- 1.9 What type of fire extinguisher should be used to extinguish an electrical fire? (1)

[30]

QUESTION 2: ADVANCED CONSTRUCTION PROCESSES

- 2.1 Define the term, *piled foundation*. (*piling*) (2)
- 2.2 Where should piled foundations be used? (1)
- 2.3 Name FOUR advantages of rib and block floors over solid concrete floors. (4)
- 2.4 Name THREE materials that you would require when installing a rib and block concrete floor. (3)
- 2.5 Name THREE joining methods that can be used to join gusset plates to members of a steel structure. (3)
- 2.6 At modern houses with high concrete columns, the steel reinforcement is very important. Draw to scale 1 : 10 a neat sketch of a horizontal section through a round column to show the reinforcement and label all the parts.
- Use the following specifications:
- Reinforcement with six main bars of 20 mm diameter
 - Show helical binding
 - Show the minimum concrete covering
 - The concrete column has a diameter of 500 mm (10)
- 2.7 Name TWO different types of measurements that can be taken with a dumpy level. (2)
- 2.8 Name TWO tests that can be done on concrete to determine its strength. (2)
- 2.9 Explain the difference between mass concrete and reinforced concrete. (4)
- 2.10 Draw to good proportion a line diagram of a fan type roof truss with a pitch of 30°. (6)
- 2.11 Building regulations require that basement floors should be waterproof. Name THREE methods that can be used to ensure that basement floors will be watertight. (3)

[40]

QUESTION 3: CIVIL SERVICES

- 3.1 Complete the following sentences. Write down only the missing word.
- 3.1.1 The ... is used to regulate the temperature in an electric geyser. (1)
- 3.1.2 Where drain pipes connect with the municipal sewer, a ... should be inserted in front of the connection. (1)
- 3.1.3 At the outlet of a basin, a ... should be installed to remove fats and oils from the sewage water. (1)
- 3.1.4 The ... is used to control the water flow into holding tanks. (1)
- 3.1.5 With domestic wiring, the live conductor is indicated with a ... colour code. (1)
- 3.2 Explain the purpose and advantage of a distribution board at an electrical circuit in a house. (1)
- 3.3 PVC-pipes are commonly used in households. Name FIVE advantages of PVC-pipes. (5)
- 3.4 Cold water is essential in a household for all sanitary fittings. Explain how water gets from the municipal reservoirs to inside the plot of each consumer. Name all the appliances which are used in the process. (5)
- 3.5 Explain shortly how a nuclear power station works. (2)
- 3.6 State TWO advantages of wind energy. (2)
- 3.7 Name FOUR factors that should be taken into account when solar panels are installed for a water heating system. (4)
- 3.8 Explain the purpose and advantage of installing an inspection eye in a drainage system. (2)
- 3.9 Abbreviations are used on building plans to show the position of appliances. Write down the abbreviation of the following:
- 3.9.1 Bath (1)
- 3.9.2 Manhole (1)
- 3.9.3 Gulley (1)
- 3.9.4 Ventilation pipe (1)

[30]

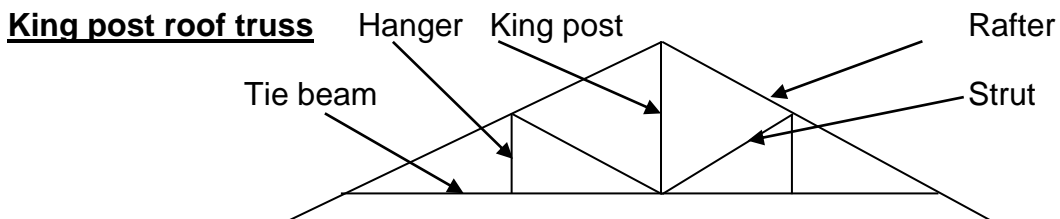
QUESTION 4: MATERIALS AND QUANTITIES

- 4.1 Plastic is commonly used to make domestic appliances and can be divided into two main groups. Name the TWO groups and give ONE characteristic of each one. (4)
- 4.2 What type of glass would you install at a toilet window? (1)
- 4.3 Study the column with materials and match it with the correct answer in COLUMN B. COLUMN A represents different materials and COLUMN B represents different uses. Write down only the letter next to the question number for example 4.3.1 B.

COLUMN A		COLUMN B	
4.3.1	Lead	A	Galvanising
4.3.2	Copper	B	Manhole lid
4.3.3	Cast iron	C	Steel reinforcing
4.3.4	Zinc	D	Soldering
4.3.5	High tensile steel	E	Electrical wiring

(5 x 1) (5)

- 4.4 You are a carpenter and have to make EIGHT root trusses for a home. Use the measurements for each member marked A–E as shown below and calculate the amount of material required.



PART	LENGTH
A – Rafter	6 500 mm
B – Tie beam	4 400 mm
C – King post	2 100 mm
D – Strut	1 800 mm
E – Hanger	1 800 mm

- Draw your own table and calculate the total amount of material needed for each part and the total for EIGHT trusses. (12)
- 4.5 Wooden roof trusses must be treated. Give THREE reasons why it must be treated with a preservative. (3)

- 4.6 When mixing concrete it is important to add the correct amount of water. Explain the role of water in the concrete mixture. (2)
- 4.7 Name THREE places where aluminium can be used in building construction. (3)

[30]

QUESTION 5: APPLIED MECHANICS

5.1 FIGURE 5.1 below shows the design of a roof truss to be erected on a building.

5.1.1 Determine graphically the magnitude of the forces in each member of the truss.

Answer on ANSWER SHEET 5.1 Use a scale of 1 mm = 1 N (9)

5.1.2 Write down the magnitude of the forces in the table on ANSWER SHEET 5.1. (5)

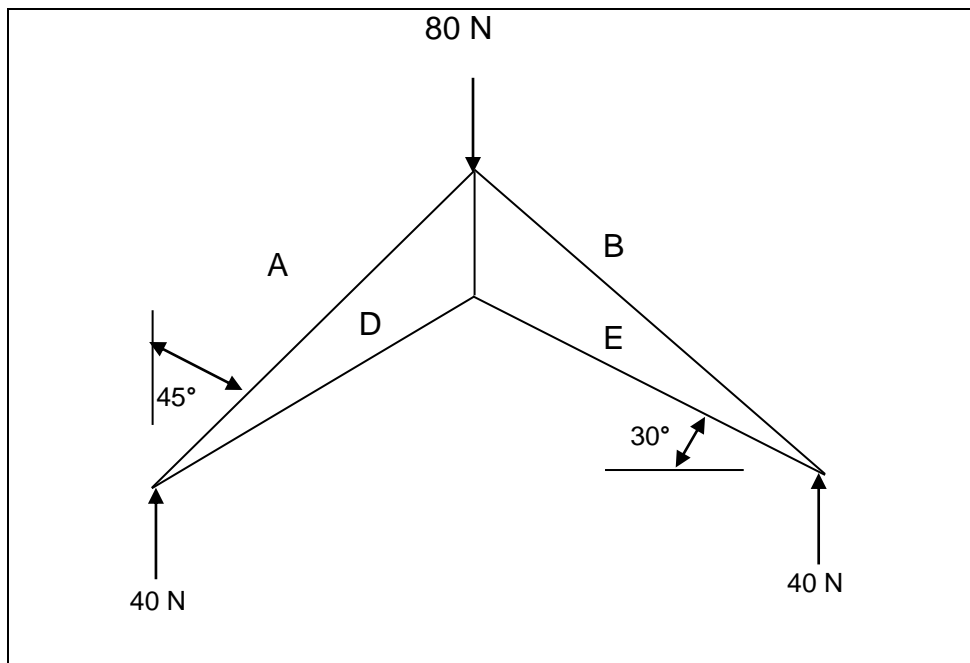


FIGURE 5.2

5.2 FIGURE 5.2 shows a beam with ONE pointed load and ONE uniform distributed load. Calculate the magnitude of the reaction forces at A and B.

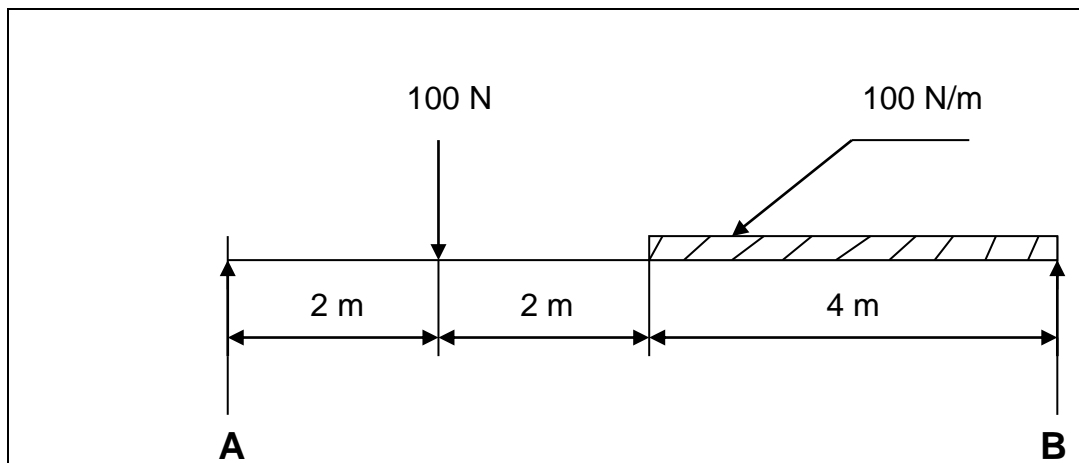
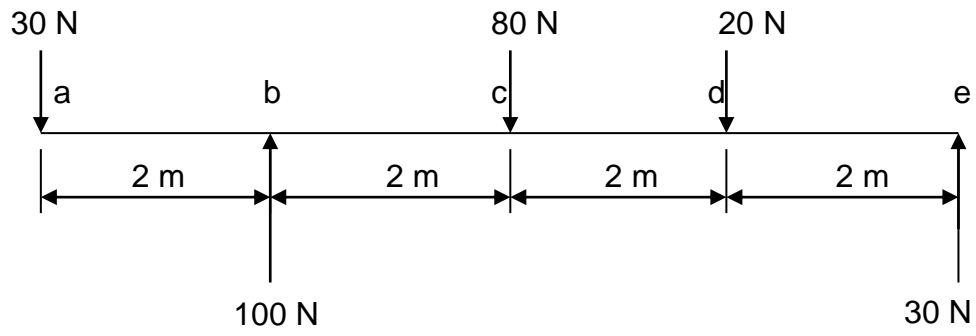


FIGURE 5.2

(8)

5.3 FIGURE 5.3 shows a beam with pointed loads. Calculate the shear force values from **a** to **e**.



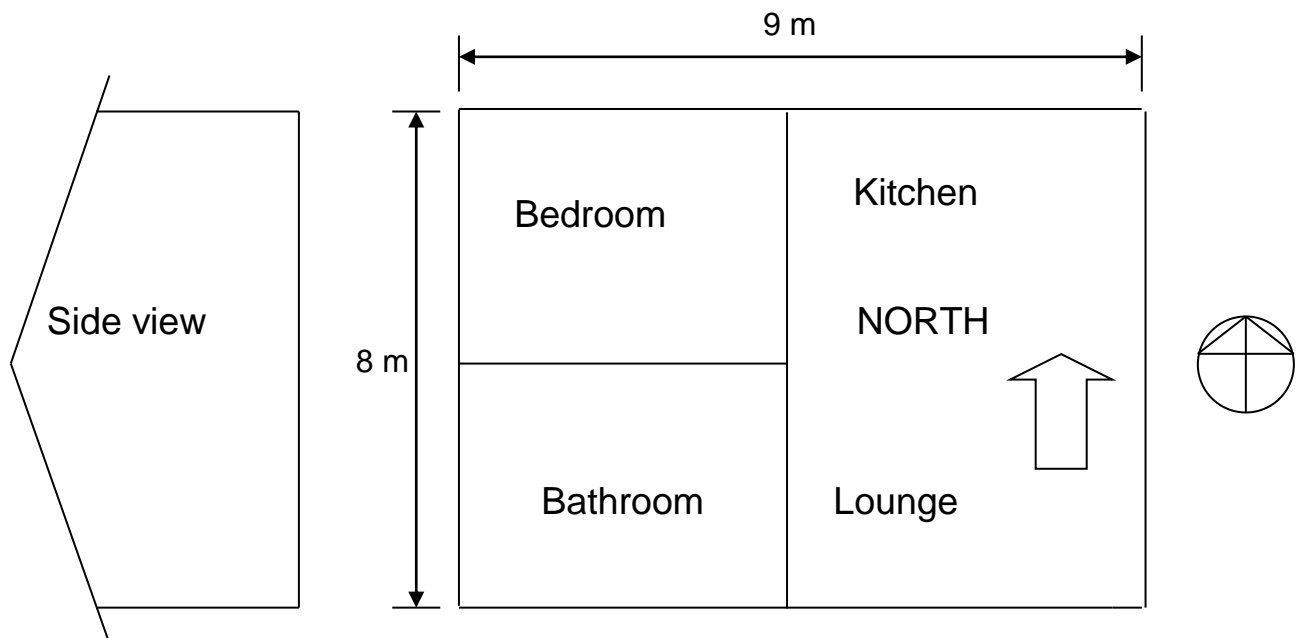
(8)
[30]

QUESTION 6: GRAPHICS AND COMMUNICATIONANSWER THIS QUESTION ON THE ATTACHED **ANSWER SHEET 6.1**

6.1 As draughtsman you are tasked to draw a low cost house.

NOTES:

- The size of the house must be 8 m x 9 m.
- The house must have THREE rooms. (Bedroom, bathroom, open plan kitchen and lounge.)
- Access from one room to the other is through inter-leading doors built into a half-brick wall.
- The front door is on the southern side of the house and the back door is on the northern side of the house which is built into a cavity wall.
The roof is gable roof construction.
- The roof has a 30° pitch with a 500 mm overhang.
- The bedroom has a door on the western side.

**SPECIFICATIONS:**

- Bathroom must have a shower, basin and water closet.
- Inside measurements for bedroom is 4 600 mm x 4 000 mm.
- Show ONE bathroom window of 900 mm x 900 mm on the western side and ONE window on the southern side.
- Show ONE bedroom window of 2 400 mm x 1 200 mm on the northern side.
- Show TWO lounge windows on the eastern side of 2 400 mm x 1 200 mm.
- All doors are 800 mm x 2 000 mm.
- Show ONE built-in cabinet in bedroom and sink and stove in the kitchen.
- Floor to ceiling height must be 2 600 mm

6.1 Use a scale of 1 : 50 to design and draw the **floor plan** of the house. (26)6.2 Draw to scale 1 : 50 the **west view** of the house. (14)**[40]****TOTAL: 200**

ANSWER SHEET 5.1 NAME OF CANDIDATE: _____

a
|

(9)

PART	FORCE
AE	
BE	
CE	
CD	
DE	

(5)

ANSWER SHEET 6.1 NAME OF CANDIDATE: _____

FLOOR PLAN

ANSWER SHEET 6.2 NAME OF CANDIDATE: _____

WEST VIEW

(14)

WES-AANSIG

ANTWOORDBLAD 6.2 NAAM VAN KANDIDAAT: _____

(26)

VLOERPLAN

ANTWOORDBLAD 6.1 NAAM VAN KANDIDAAT: _____

ANTWOORDBLAD 5.1 NAAM VAN KANDIDAAT: _____

a

(6)

(5)

DEEL	KRAG
AE	
BE	
CE	
CD	
DE	

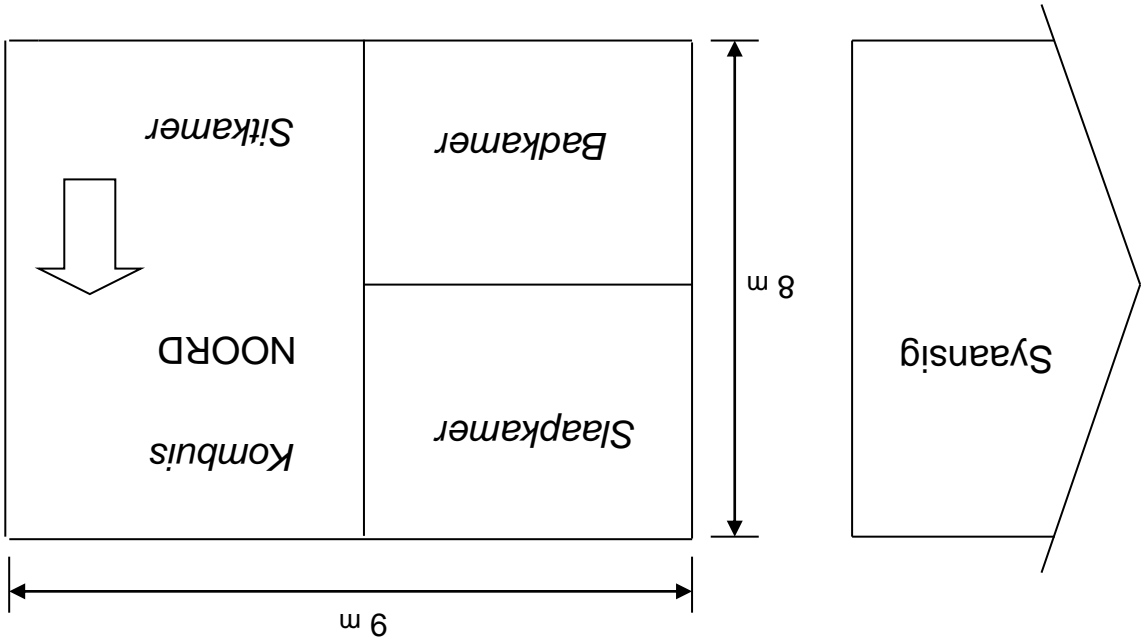
VRAAG 6: GRAFIEKE EN KOMMUNIKASIE

BEANTWOORD HIERDIE VRAAG OP DIE AANGEHEGTE **ANTWOORDBLAD 6.1.**

6.1 As tekenaar kry jy die opdrag om 'n laekoste huis te teken.

NOTAS:

- Die buitemate van die huis moet 8 m x 9 m wees.
- Die huis moet DRIE vertreke hê. (Slaapkamer, badkamer, oopplan kombuis/sitkamer)
- Toegang van een vertrek na die ander geskied deur middel van binnedure wat in 'n halfsteenmuur ingebou is.
- Die voordeur is aan die suidkant van die huis en die agterdeur aan die noordkant van die huis wat in 'n spoumuur ingebou is.
- Die dak is 'n geuweldakkonstruksie.
- Die dakhelling is 30° met 'n 500 mm oorhang.
- Die slaapkamer het 'n deur aan die westekant.

**SPESIFIKASIES:**

- Badkamer moet 'n stort, wasbak en spoelkloset hê.
- Binnemate vir slaapkamer is 4 600 mm x 4 000 mm
- Toon EEN badkamervensters van 900 mm x 900 mm aan die westekant en EEN aan suidkant.
- Toon EEN slaapkamervenster aan die noordkant van 2 400 mm x 1 200 mm.
- Toon TWEE sitkamervensters aan die oostekant van 2 400 mm x 1 200 mm.
- Alle deure is 800 mm x 2 000 mm
- Toon EEN ingeboude kas in slaapkamer en opwasbak en stoof in die kombuis.
- Vloer tot plafonhoogte moet 2 600 mm wees.

6.1

Teken volgens skaal 1 : 50 die **vloerplan** van die huis. (26)

6.2

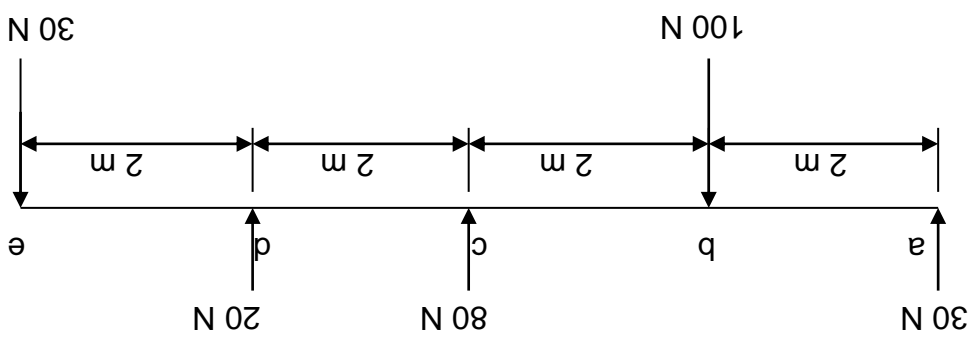
Teken volgens skaal 1 : 50 die **wes-aansig** van die huis. (14)

[40]

200

TOTAAL:

5.3 FIGUR 5.3 toon 'n balk met puntbelasting. Bereken die skuifkrag- waardes op punte a tot e.



(8) [30]

VRAAG 5: TOEGEPASTE MEGANIKA

5.1 FIGUR 5.1 hieronder toon die ontwerp van 'n dakkap wat op 'n gebou opgerig moet word.

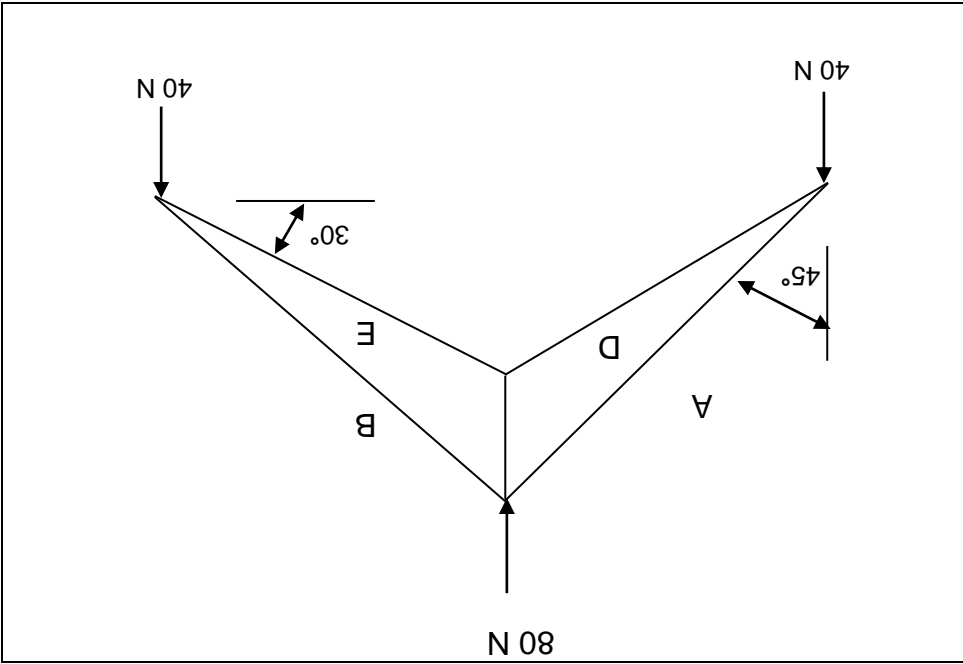
5.1.1 Bepaal grafies die grootte van die kragte in elke onderdeel van die kap.

Beantwoord op ANTWOORDBLAD 5.1 Gebruik 'n skaal van $1 \text{ mm} = 1 \text{ N}$

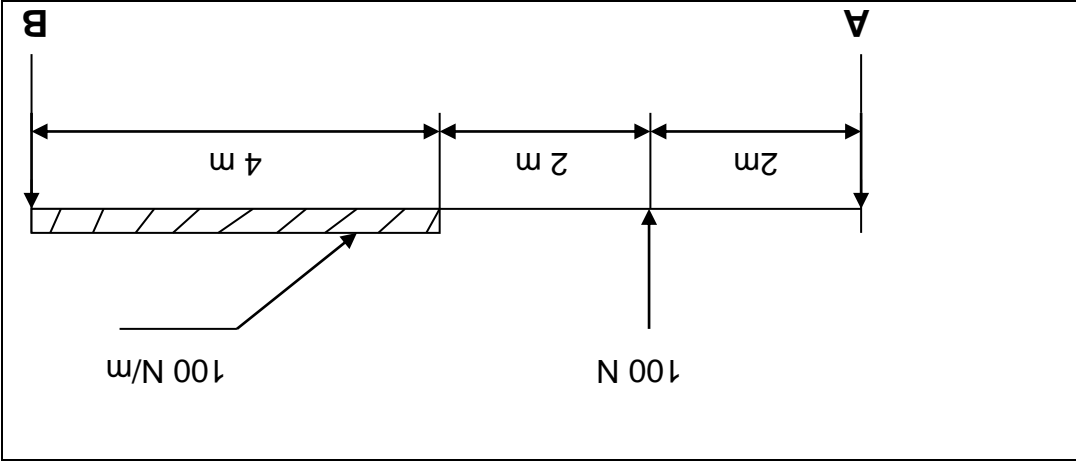
(9)

5.1.2 Skryf die grootte van kragte in die tabel op ANTWOORDBLAD 5.1

(5)



FIGUR 5.2



FIGUR 5.2

(8)

5.2 FIGUR 5.2 toon 'n balk met EEN puntbelasting en EEN gelykmatig verspreide belasting. Bereken die grootte van die reaksiekragte by A en B.

- 4.6 Wanneer beton gemeng word is dit belangrik om die regte hoeveelheid water by te voeg. Verduidelik wat die rol van water in 'n betonmengsel is. (2)
- 4.7 Noem DRIE plekke waar aluminium in boukonstruksie gebruik kan word. (3)

[30]

VRAAG 4: MATERIALE EN HOEVEELHEDE

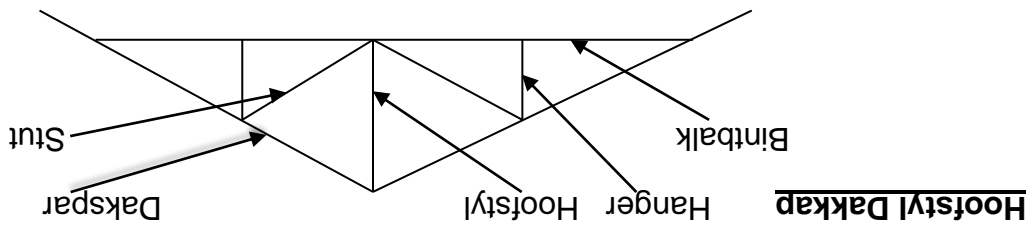
- 4.1 Plastiek word algemeen gebruik om huishoudelike toebehore te vervaardig en word in twee hoofgroepe ingedeel. Noem die TWEE hoofgroepe en gee EEN belangrike eienskap van elkeen. (4)
- 4.2 Watter tipe glas sal jy vir 'n toiletvenster gebruik? (1)

- 4.3 Bestudeer die kolom met metale en pas dit by die geskikte antwoord in KOLOM B. KOLOM A verteenwoordig verskillende metale en KOLOM B verteenwoordig 'n aantal gebruike. Skryf slegs die letter neer langs die vraagnommer byvoorbeeld 4.3.1 B. (5)

KOLOM A		KOLOM B	
4.3.1	Lood	A	Galvanisering
4.3.2	Koper	B	Mangatdeksel
4.3.3	Gietyster	C	Staalversterking
4.3.4	Sink	D	Soldeerseel
4.3.5	Hoë spanningstaal	E	Elektriese bedrading

- (5) (5 x 1)

- 4.4 Jy is 'n skryfwerker en moet AGT dakkappe vir 'n gebou vervaardig. Gebruik die afmetings van elke deel gemerk A-E in die skets soos hieronder aangetoon en bereken die hoeveelheid materiaal wat benodig word. (5)



ONDERDEEL	LENGTE
A – Dakspaar	6 500 mm
B – Bintbalk	4 400 mm
C – Hooftstyl	2 100 mm
D – Stut	1 800 mm
E – Hanger	1 800 mm

- Teken jou eie tabel en bereken die hoeveelheid van elke deel wat benodig word en die totaal van die materiaal benodig vir AGT dakkappe. (12)
- 4.5 Houtdakkappe moet behandel word. Gee DRIE redes waarom dit nodig is om dakkappe met 'n preserveermiddel te behandel. (3)

VRAAG 3: SIVIELE DIENSTE

- 3.1 Voltooi die volgende sinne deur slegs die ontbrekende woord nêr te skryf.
- 3.1.1 Die ... word gebruik om die temperatuur in 'n elektriese geiser te reguleer. (1)
- 3.1.2 Waar rioolpype by die munisipale straatrool aansluit moet 'n ... voor elke koppeling aangebring word. (1)
- 3.1.3 By opwasbakke moet 'n ... aangebring word om vette en olies uit rioolwater te haal. (1)
- 3.1.4 Die ... word gebruik om watertoewer na toevoertienks te beheer. (1)
- 3.1.5 By huisbedrading word lewendige drade met 'n ... kleurkode aangedui. (1)
- 3.2 Verduidelik die funksie van 'n verdeelbord by 'n elektriese stelsel in 'n huis. (1)
- 3.3 PVC-pype word algemeen in huishoudings gebruik. Noem VYF voordele van PVC-pype. (5)
- 3.4 Koue water word in huishoudings vir sanitêre doeleindes benodig. Verduidelik hoe water vanaf die munisipale reservoïrs tot binne die erf van die verbruiker kom. Noem al die toebehoere wat in die proses gebruik word. (5)
- 3.5 Verduidelik kortliks hoe 'n kernkragstasie werk. (2)
- 3.6 Noem TWEE voordele van windenergie. (2)
- 3.7 Noem VIER faktore wat in aanmerking geneem moet word wanneer sonpanele vir 'n waterverhittingstelsel geïnstalleer word. (4)
- 3.8 Verduidelik die doel van 'n inspeksie-oog en die voordeel wat die installering daarvan inhou. (2)
- 3.9 Afkortings word op boupiane gebruik om sekere toebehoere aan te dui. Skryf die afkorting nêr vir die volgende:
- 3.9.1 Bad (1)
- 3.9.2 Mangat (1)
- 3.9.3 Rioolput (1)
- 3.9.4 Ventilasiestyp (1)

[30]

VRAAG 2: GEVORDERDE KONSTRUKSIEPROSESSE

- 2.1 Verduidelik die begrip, *heipaalfondasie*. (2)
- 2.2 Waar sal jy 'n heipaalfondasie gebruik? (1)
- 2.3 Noem VIER voordele van rib- en blokhangvloere bo soliede betonvloere. (4)
- 2.4 Noem DRIE materiale wat jy sal benodig indien jy 'n rib- en blokhangvloer moet installeer. (3)
- 2.5 Noem DRIE hegmetodes wat gebruik kan word om knooppate aan onderdele van staalstrukture te heg. (3)
- 2.6 By moderne huise met hoë betonkolomme speel bewapening 'n belangrike rol. Teken tot skaal 1 : 10 'n netjiese skets van 'n horisontale snit deur 'n ronde kolom om die nodige bewapening binne-in te toon en benoem alle dele.
Gebruik die volgende spesifikasies:
- Bewapening met ses hoofstawe van 20 mm deursnee
 - Toon heliese binder
 - Toon die minimum betonbedekking.
 - Die betonpilaar het 'n deursnee van 500 mm
- 2.7 Noem TWEE soorte afmetings wat met die bukswaterpas geneem kan word. (2)
- 2.8 Noem TWEE toetse wat op beton gedoen kan word om die sterkte daarvan te bepaal. (2)
- 2.9 Verduidelik die verskil tussen massabeton en gewapende beton. (4)
- 2.10 Teken in goeie verhouding 'n lyndiagram van 'n waaiertipe dakkap met 'n helling van 30°. (6)
- 2.11 Bouregulasies vereis dat kelder verdiepings waterdig moet wees. Noem DRIE metodes wat gebruik kan word om te verseker dat kelder verdiepings waterdig is. (3)

[40]

VRAAG 1: KONSTRUKSIEPROSESSE

- 1.1 As 'n skryfwerker is dit jou taak om 'n deur in 'n kosyn te pas. Een van die gereedskapstukke wat jy gaan gebruik is 'n draagbare elektriese boor. Noem VIER veiligheidsmaatreëls wat toegepas moet word by die gebruik van die boor. (4)
- 1.2 'n Muurplaat moet verleng word. Watter tipe voeg sal jy gebruik om die muurplaat te las? (1)
- 1.3 Steierwerk word algemeen op 'n bouperseel gebruik. (1)
- 1.3.1 Definieer die term *steierwerk*. (2)
- 1.3.2 Noem TWEE tipes steiers. (2)
- 1.3.3 Watter onderdeel van 'n steier sal verhoed dat die steier in die grond wegsak? (1)
- 1.3.4 Noem VYF veiligheidsmaatreëls wat by die oprigting van steiers toegepas moet word. (5)
- 1.4 Noem TWEE hegmetodes wat gebruik kan word om golfysterdakplaat aan kaplatte vas te heg. (2)
- 1.5 Verduidelik waarom dit belangrik is om dakkappe te verspan. (4)
- 1.6 Verduidelik hoe jy uitermatige eksternê bloeding van 'n ledemaat sal stop. (2)
- 1.7 Noem DRIE groepe verdursamingsmiddels vir hout. (3)
- 1.8 Noem DRIE elemente wat noodsaaklik is vir 'n vuur om plaas te vind. (3)
- 1.9 Watter tipe brandblusser moet gebruik word om 'n elektriese vuur te blus? (1)

[30]

BENODIGHEDE:

1. Teken gereedskap

2. 'n Nieprogrammeerbare sakrekenaar

INSTRUKSIES EN INLIGTING

1. Hierdie vraestel bestaan uit SES vrae.
2. AL die vrae is VERPLIGTEND.
3. Beantwoord elke vraag as 'n geheel. MOET NIE onderafdelings skei NIE.
4. Begin elke vraag op 'n NUWE bladsy.
5. Sketse kan gebruik word om jou antwoorde te illustreer.
6. ALLE berekeninge en geskrewe antwoorde moet in die antwoordeboek gedoen word.
7. Tekeninge en sketse moet volledig en netjies van afmetings, byskrifte en titels voorsien word soos voorgeskryf deur SANS (SABS) se Gebruikskode vir Boutekenepraktik.
8. Vir die doeleindes van hierdie vraestel moet die afmetings van 'n steen as 220 mm x 110 mm x 75 mm geneem word.
9. Gebruik jou eie oordeel waar afmetings en/of detail ontbreek.
10. Nieprogrammeerbare sakrekenaars mag gebruik word.
11. Beantwoord VRAAG 5.1 en VRAAG 6 op die aangehegte antwoordblaaie, deur teken gereedskap te gebruik waar nodig.

Hierdie vraestel bestaan uit 13 bladsye.



TYD: 3 uur

PUNTE: 200

SIVIELE TEGNOLOGIE

SEPTEMBER 2013

GRAAD 12

**NASIONALE
SENIOR SERTIFIKAAT**

Province of the
EASTERN CAPE
EDUCATION

