



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

26 November 2025

This marking guideline consists of 7 pages.

QUESTION 1

- 1.1 The purpose of a roof is to protect the structure of the building✓ and its contents from the elements of nature (rain, hail, snow, sun and wind).✓ (2)
- 1.2
- Copper
 - Lead
 - Galvanised iron sheeting
 - Asbestos cement slate
 - Natural slates
 - Wood shingles
 - Thatch
 - Malthoid
 - Clay and concrete tiles
 - Fibre glass sheets
- (Any 5 × 1) (5)
- 1.3
- 1.3.1
- Mixture of well-graded sand and Portland cement
 - Manufacture in various profiles
 - Tough
 - Durable
 - Inflammable
- (Any 2 × 1)
- 1.3.2
- High resistance to puncture
 - Easy to apply
 - Self-healing
 - Not too expensive
 - Waterproof
 - Material will not expand in high temperatures and will not crack at low temperatures
- (Any 2 × 1)
(2 × 2) (4)
[11]

QUESTION 2

- 2.1 Take moments about R_R to calculate the magnitude of R_L :
 $\sum CW \text{ moments} = \sum ACW \text{ moments}✓$
 $(R_L \times 14) = (20 \times 18) + (45 \times 12) + [(7 \times 14) \times 7] \text{ OR } (98 \times 7)✓$
 $(R_L \times 14) = 360 + 540 + 686✓$
 $R_L = \frac{1\,586}{14}✓$
 $R_L = 113,286 \text{ kN}✓$ (5)

2.2 Take moments about R_L to calculate the magnitude of R_R :

$$\sum \text{ACW moments} = \sum \text{CW moments} \checkmark$$

$$(R_R \times 14) + (20 \times 4) = (45 \times 2) + [(7 \times 14) \times 7] \text{ OR } (98 \times 7) \checkmark$$

$$(R_R \times 14) = 90 + 686 - 80 \checkmark$$

$$R_R = \frac{696}{14} \checkmark$$

$$R_R = 49,714 \text{ kN} \checkmark$$

(5)

2.3 Test the answer to prove equilibrium:

$$\sum \text{upward forces} = \sum \text{downward forces}$$

$$(113,286 \text{ kN} + 49,714 \text{ kN}) \checkmark = (20 \text{ kN} + 45 \text{ kN} + 98 \text{ kN}) \checkmark$$

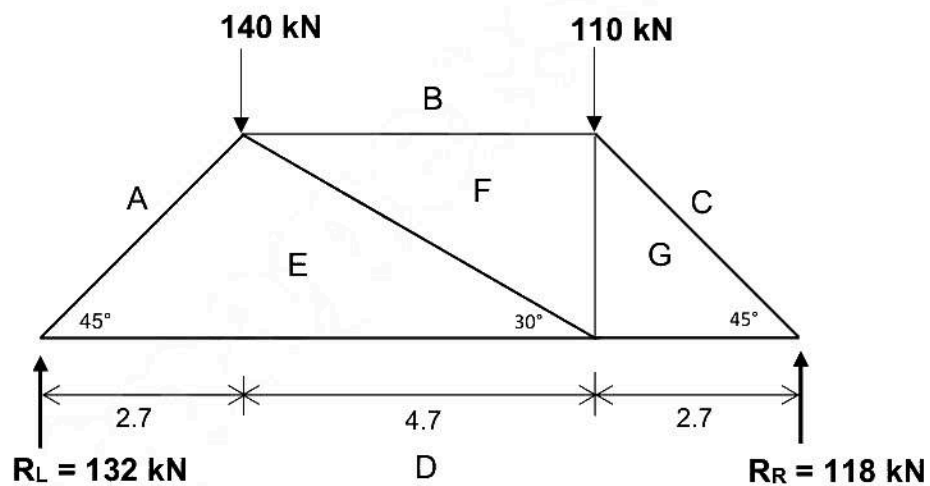
$$163 \text{ kN} = 163 \text{ kN} \checkmark$$

(3)

[13]

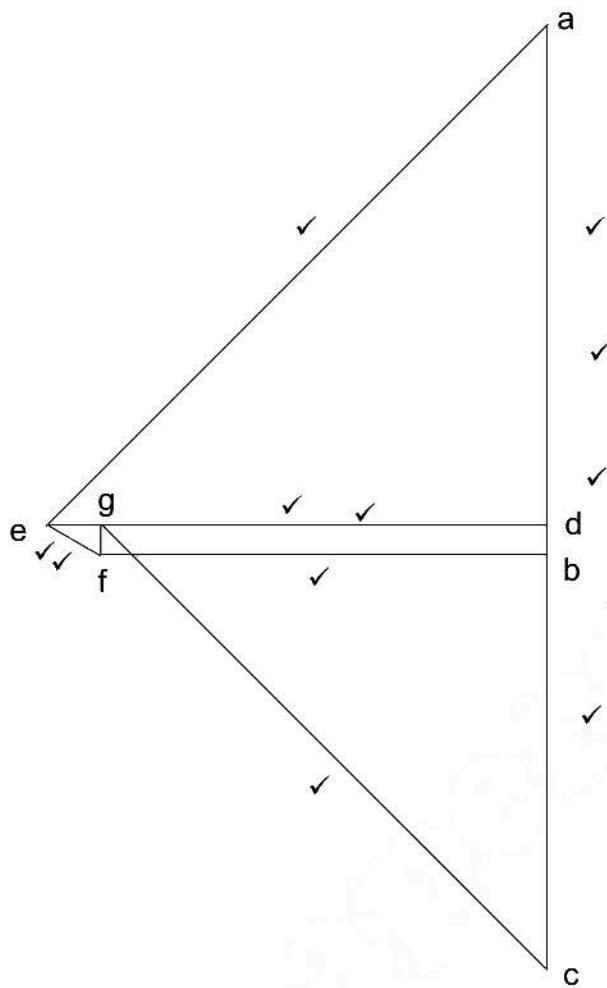
QUESTION 3

3.1



(2)

3.2



(12)

3.3

MEMBER	MAGNITUDE	NATURE
AE	94 kN	Strut
BF	59 kN	Strut
CG	83 kN	Strut
DE	66 kN	Tie
EF	8 kN	Strut
FG	4 kN	Tie
DG	59 kN	Tie

Tolerance = ± 3 kN ($14 \times \frac{1}{2}$)

(7)
[21]

QUESTION 4

MEMBER	4.1 AREA	4.2 DISTANCE	4.3 AREA × DISTANCE
A1	$30 \times 52 = 1\,560 \text{ cm}^2 \checkmark$	$26 \text{ cm} \checkmark$	$1\,560 \text{ cm}^2 \times 26 \text{ cm} = 40\,560 \text{ cm}^3 \checkmark$
A2	$\frac{1}{2} \times 15 \times 15 = -112,5 \text{ cm}^2 \checkmark$	$15 \text{ cm} \checkmark$	$112,5 \text{ cm}^2 \times 15 \text{ cm} = -1\,687,5 \text{ cm}^3 \checkmark$
A3	$20 \times 10 = -200 \text{ cm}^2 \checkmark$	$42 \text{ cm} \checkmark$	$200 \text{ cm}^2 \times 42 \text{ cm} = -8\,400 \text{ cm}^3 \checkmark$
TOTALS	$= 1\,247,5 \text{ cm}^2 \checkmark$		$= 30\,472,5 \text{ cm}^3 \checkmark \checkmark$
Marks	(4)	(3)	(5)

4.4 $y = \frac{(\text{total area} \times \text{distance})}{\text{total area}} \checkmark$

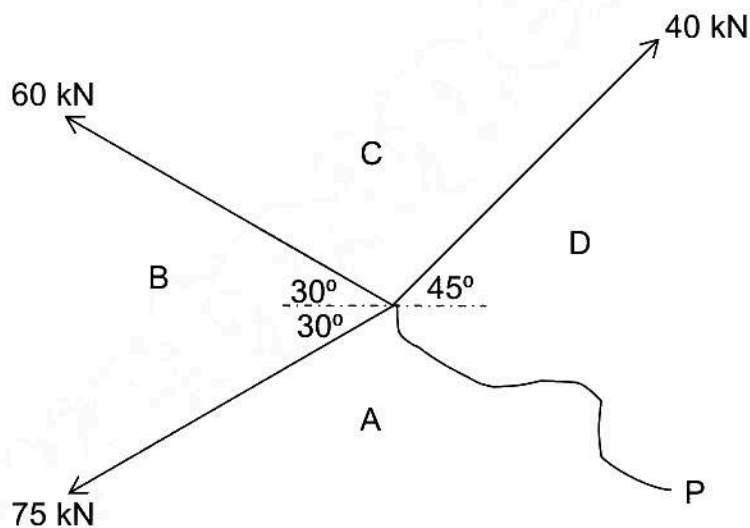
$$y = \frac{30\,472,5 \text{ cm}^3 \checkmark}{1\,247,5 \text{ cm}^2}$$

$$y = 24,427 \text{ cm X-X} \checkmark \checkmark$$

(4)
[16]

QUESTION 5

5.1



(2)

5.2	Force	Vertical component		Horizontal component	
	AB	$75 \times \sin 30^\circ \checkmark$	$-37,5 \checkmark$	$75 \times \cos 30^\circ \checkmark$	$-64,952 \checkmark$
	BC	$60 \times \sin 30^\circ \checkmark$	$30 \checkmark$	$60 \times \cos 30^\circ \checkmark$	$-51,962 \checkmark$
	CD	$40 \times \sin 45^\circ \checkmark$	$28,284 \checkmark$	$40 \times \cos 45^\circ \checkmark$	$28,284 \checkmark$
		ΣVC	$20,784 \checkmark \checkmark$	ΣHC	$-88,63 \checkmark \checkmark$

$$\begin{aligned}
 R^2 &= VC^2 + HC^2 \\
 &= (20,784)^2 + (-88,63)^2 \checkmark \\
 &= 91,034 \text{ kN} \checkmark \checkmark
 \end{aligned}$$

$$\tan \alpha = \frac{\Sigma VC}{\Sigma HC}$$

$$\tan \alpha = \frac{20,784 \checkmark}{-88,63}$$

$$\tan \alpha = 0,235 \checkmark$$

$$\alpha = \tan^{-1} 0,235 \checkmark$$

$$\alpha = 13,225^\circ \checkmark \checkmark$$

$$“P” = 91,034 \text{ kN at } 13,225^\circ \text{ (north of west or above horizontal to the left)} \checkmark \checkmark$$

$$(26 \times \frac{1}{2})$$

(13)

[15]

QUESTION 6

6.1 6.1.1 If the body is submerged in a liquid, it is subjected to an upward thrust, ✓ which is equal to the weight of the liquid displaced. ✓

6.1.2 The density of a substance is the mass per unit volume of the substance, ✓ expressed in g/cm^3 or kg/m^3 . ✓

$$(2 \times 2)$$

(4)

6.2 Saturation coefficient = $\frac{\text{volume of water absorbed} \checkmark}{\text{volume of pores}}$

$$\text{Saturation coefficient} = \frac{1,031 \checkmark}{1,045}$$

$$\text{Saturation coefficient} = 0,987 \checkmark$$

(3)

- 6.3
- Conduction
 - Convection
 - Radiation

(3)

- 6.4 Apparatus
- Two sheets of metal of equal length and area (one being copper and one being steel)✓✓
 - Glass container✓
 - Boiling water✓

Method:

- Tie the copper and steel bars together to form a combined bar.✓
- Boil the water and pour it into the glass container.✓
- Place the piece of metal into the hot water for at least 20 minutes.✓

Observations:

- When heat is applied, the metal strips becomes arched in such a way that the copper is on the outer side of the arch.✓

Conclusion:

- Different materials expand differently.✓ (Any relevant 9 × 1) (9)

- 6.5
- | | | |
|-------|---|-----|
| 6.5.1 | True | (1) |
| 6.5.2 | True | (1) |
| 6.5.3 | False.✓ Temperature is the condition of a substance with regard to its degree of coldness or hotness.✓✓ | |

OR

False.✓ Heat is the transfer of energy from one substance to another.✓✓

(3 × 1) (3)
[24]

TOTAL: 100