



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

31 July 2024

This marking guideline consists of 7 pages.

QUESTION 1

- 1.1 False ✓
- 1.2 True ✓
- 1.3 False ✓
- 1.4 True ✓
- 1.5 True ✓
- 1.6 False ✓
- 1.7 True ✓
- 1.8 False ✓
- 1.9 True ✓
- 1.10 False ✓

(10 × 1) [10]

QUESTION 2

- 2.1 Take moments about R_R to calculate the magnitude of R_L .

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

$$(R_L \times 6,5) \checkmark = (50 \times 8) + (25 \times 4) + (30 \times 2,5) \checkmark$$

$$(R_L \times 6,5) = 400 + 100 + 75 \checkmark$$

$$R_L = \frac{575}{6,5} \checkmark$$

$$R_L = 88,462 \text{ kN} \checkmark$$

(6)

- 2.2 Take moments about R_L to calculate the magnitude of R_R .

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

$$(R_R \times 6,5) \checkmark + (50 \times 1,5) = (25 \times 2,5) + (30 \times 4) + (25 \times 6,5) \checkmark$$

$$(R_R \times 6,5) = 62,5 + 120 + 162,5 - 75 \checkmark$$

$$R_R = \frac{270}{6,5} \checkmark$$

$$R_R = 41,538 \text{ kN} \checkmark$$

(6)

- 2.3 Test the answer to prove equilibrium:

$$\sum \text{Upward forces} = \sum \text{Downward forces}$$

$$(88,462 \text{ kN} + 41,538 \text{ kN}) = (50 \text{ kN} + 25 \text{ kN} + 30 \text{ kN} + 25 \text{ kN}) \checkmark$$

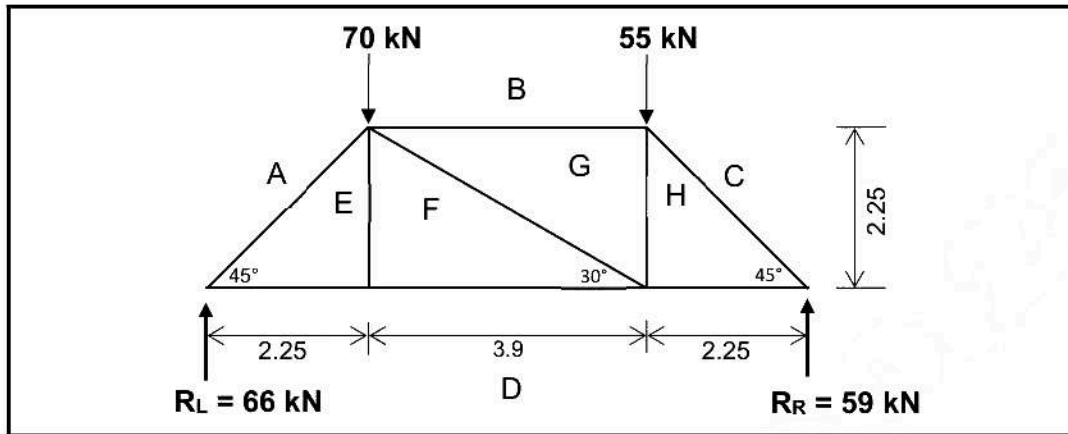
$$130 \text{ kN} = 130 \text{ kN} \checkmark$$

(2)

[14]

QUESTION 3

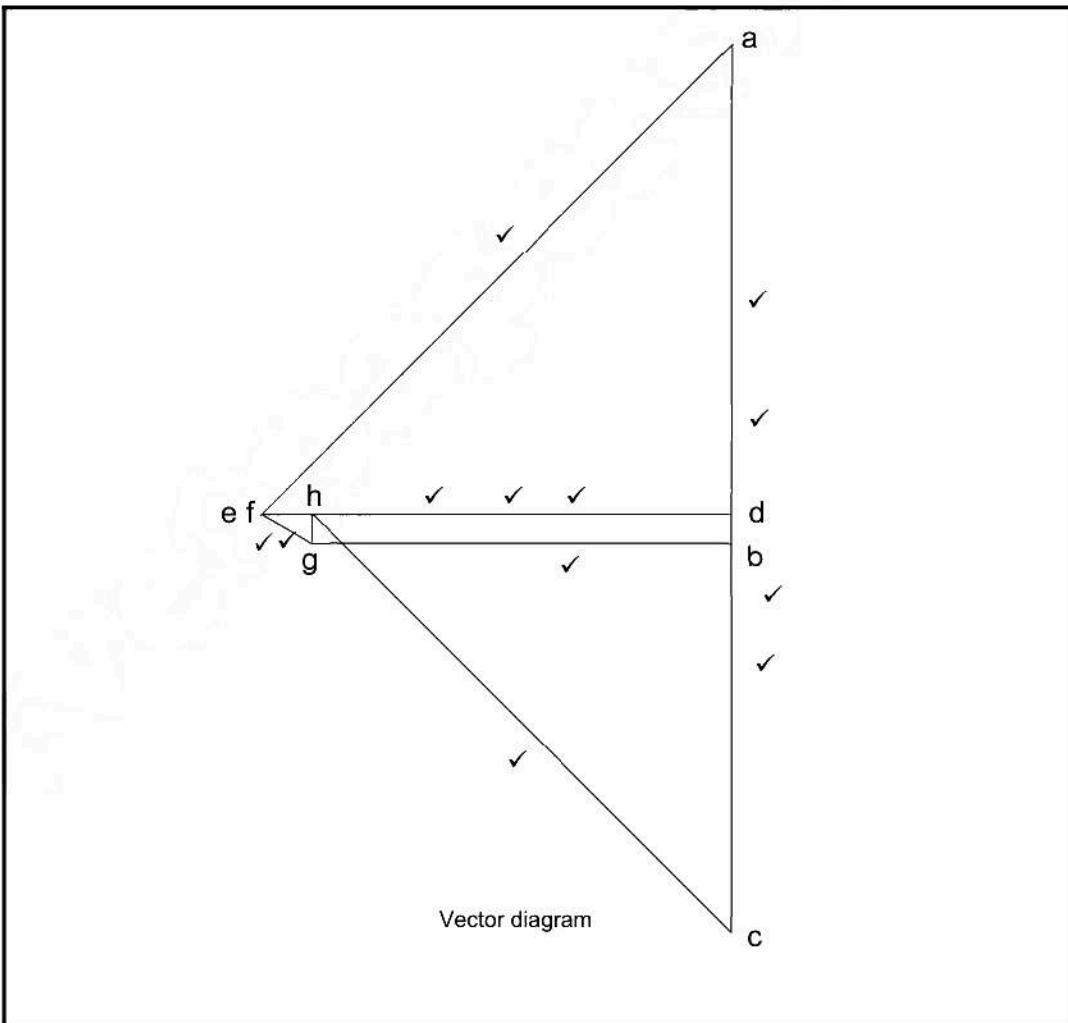
3.1



(2 marks redraw, 2 marks Bow's notation)

(4)

3.2



(12)

3.3

MEMBER	MAGNITUDE	NATURE
AE	94 kN ✓	Strut ✓
BG	59 kN ✓	Strut ✓
CH	83 kN ✓	Strut ✓
DE	66 kN ✓	Tie ✓
DF	66 kN ✓	Tie ✓
DH	59 kN ✓	Tie ✓
EF	0 kN ✓	Retardant ✓
FG	4 kN ✓	Strut ✓
GH	4 kN ✓	Tie ✓

=/- 1 tolerance

(18 × ½)

(9)
[25]

QUESTION 4

4.1

MEMBER	4.1.1 AREA	4.1.2 Y-DISTANCE FROM X-X	4.1.3 AREA × DISTANCE OR MOMENTS
A1	$60 \times 70 = 4\,200 \text{ cm}^2 \checkmark$	$35 \text{ cm} \checkmark$	$4\,200 \text{ cm}^2 \times 35 \text{ cm} = 147\,000 \text{ cm}^3 \checkmark$
A2	$\frac{1}{4} \times \pi \times 22^2 = -380,133 \text{ cm}^2 \checkmark$	$41 \text{ cm} \checkmark$	$380,133 \text{ cm}^2 \times 41 \text{ cm} = -15\,585,453 \text{ cm}^3 \checkmark$
A3	$\frac{1}{2} \times 60 \times 25 = 750 \text{ cm}^2 \checkmark$	$82.5 \text{ cm} \checkmark$	$750 \text{ cm}^2 \times 82,5 \text{ cm} = 58\,747,5 \text{ cm}^3 \checkmark$
TOTALS	$= 4\,569,867 \text{ cm}^2 \checkmark$ (4)	(3)	$= 190\,162,047 \text{ cm}^3 \checkmark \checkmark$ (5)

$$4.1.4 \quad \bar{y} = \frac{(\text{TOTAL AREA} \times \text{DISTANCE})}{\text{TOTAL AREA}} \checkmark$$

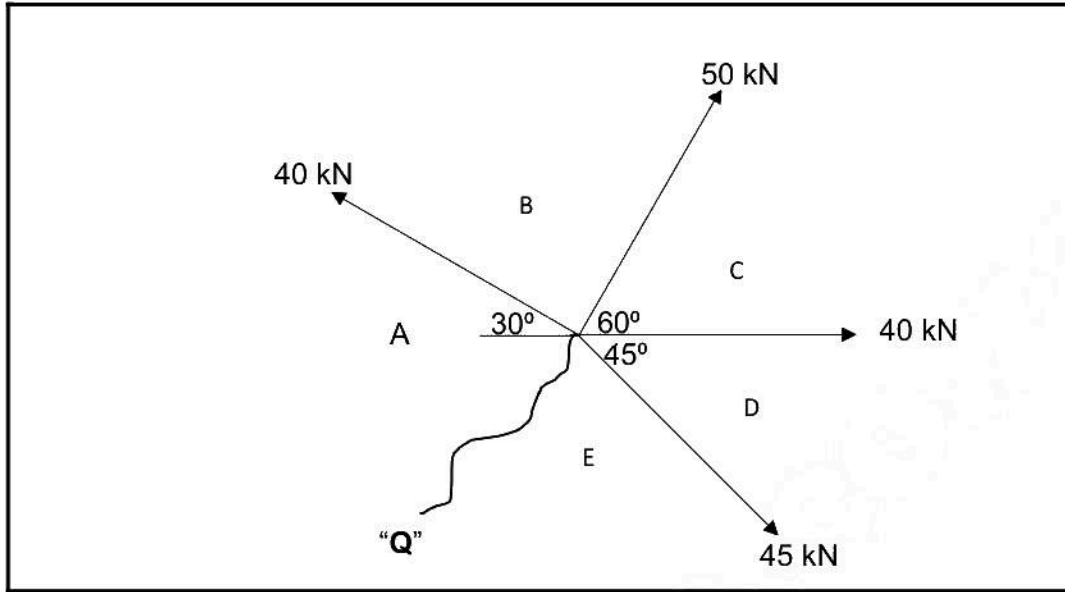
$$\bar{y} = \frac{190\,162,047 \text{ cm}^3 \checkmark}{4\,569,867 \text{ cm}^2}$$

$$\bar{y} = 41,612 \text{ cm} \checkmark \checkmark$$

(4) (16)

STION 5

5.1



(3)

5.2

Force	Vertical Component		Horizontal Component	
AB	$40 \times \sin 30^\circ$ ✓	20✓	$40 \times \cos 30^\circ$ ✓	-34,641✓
BC	$50 \times \sin 60^\circ$ ✓	43,301✓	$50 \times \cos 60^\circ$ ✓	25✓
CD	$40 \times \sin 0^\circ$ ✓	0✓	$40 \times \cos 0^\circ$ ✓	40✓
DE	$45 \times \sin 45^\circ$ ✓	-31,82✓	$45 \times \cos 45^\circ$ ✓	31,82✓
	ΣVC	31,481✓	ΣHC	62,179✓

$$R^2 = VC^2 + HC^2$$

$$R^2 = (31,481)^2 + (62,179)^2$$

$$= 69,694 \text{ kN}$$

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

$$\tan \alpha = \frac{31,481}{62,179}$$

$$\tan \alpha = 0,506$$

$$\alpha = \tan^{-1} 0,506$$

$$\alpha = 26,839^\circ$$

$$\text{"Q"} = 67,916 \text{ kN @ } 27,61^\circ \text{ (North of east or above horizontal to the right)}$$

$$(24 \times \frac{1}{2})$$

(12)

[15]

QUESTION 6

- 6.1
- Fuel ✓
 - Heat ✓
 - Oxygen ✓
- (3)
- 6.2
- Convection ✓
 - Conduction ✓
 - Radiation ✓
- (3)
- 6.3
- Clay tiles ✓
 - Concrete tiles ✓
 - Corrugated fibre sheets ✓
 - Fibreglass / Glass fibre sheet ✓
 - Galvanised iron sheets ✓
 - Natural Slates ✓
 - Asbestos cement Slates ✓
 - Wood shingles ✓
 - Malthoid ✓
 - Thatch ✓
 - Harvey tiles ✓
 - Oppen ✓
 - Lead ✓
- (Any 4 × 1) (4)
- 6.4
- 6.4.1
- Wood ✓
 - Sand ✓
 - Concrete ✓
 - Bricks ✓
 - Limestone ✓
- (Any 2 × 1)
- 6.4.2
- Polythene ✓
 - Steel ✓
 - Copper ✓
 - Dense bricks ✓
 - Glass ✓
 - Slate ✓
- (Any 2 × 1)
(2 × 2) (4)
- 6.5 Pushed up, ✓ kept up or brought to the surface ✓
- (2)
[16]

TOTAL: 100