higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N2

22 November 2024

This marking guideline consists of 7 pages.

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QUESTION 1

1.1 1.1.1 The law of moments states that if a system of forces is in equilibrium✓ then some of the clockwise moments around any turning point✓ will be equal to the sum of the anti-clockwise moments around the same turning point.✓ (3)

1.1.2 The equilibrant is that single force✓ which keeps two or more forces✓ working on a point in equilibrium.✓ (3)

1.2 1.2.1 Coplanar forces are forces which lie✓ in the same plane✓ and Concurrent forces are forces which act at, or from,✓ the same point.✓ (4)

1.2.2 The centroid of a body is that point about which the mass✓ of the body is considered to act✓ and A couple is when two equal parallel forces✓ work in opposite directions on a working line.✓ (4)

[14]

QUESTION 2

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

$$\sum \text{CW Moments} = \sum \text{ACW Moments} ✓$$
$$(R_L \times 8.5) ✓ = (40 \times 10) + (15 \times 6.5) + (60 \times 3) ✓$$
$$(R_L \times 8.5) = 400 + 97.5 + 180 ✓$$
$$R_L = \frac{677.5}{8.5} ✓$$
$$R_L = 79.706 \text{ KN } ✓$$

(6)

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

$$\sum \text{ACW Moments} = \sum \text{CW Moments} ✓$$
$$(R_R \times 8.5) ✓ + (40 \times 1.5) = (15 \times 2) + (60 \times 5.5) ✓$$
$$(R_R \times 8.5) = 30 + 330 - 60 ✓$$
$$R_R = \frac{300}{8.5} ✓$$
$$R_R = 35.294 \text{ KN} ✓$$

(6)

2.3 Test the answer to prove equilibrium:

$$\sum \text{Upwards Forces} = \sum \text{Downwards Forces}$$
$$(79.706 \text{ kN} + 35.294 \text{ kN}) = (40 \text{ kN} + 15 \text{ kN} + 60 \text{ kN}) ✓$$
$$115 \text{ kN} = 115 \text{ kN} ✓$$

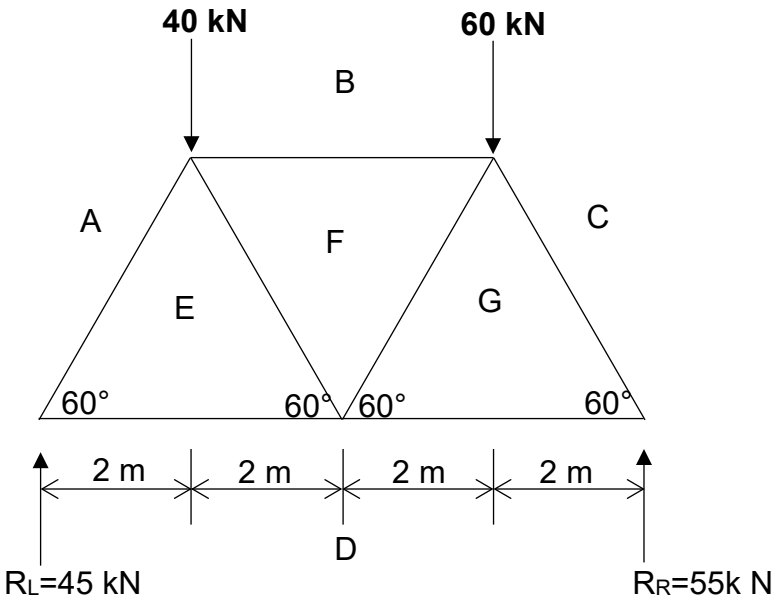
(2)

[14]

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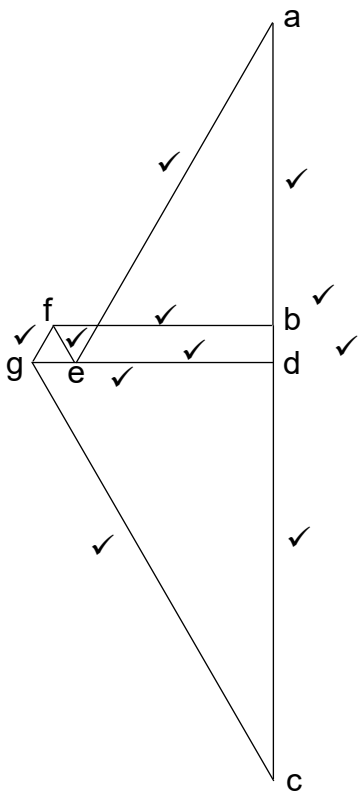
QUESTION 3

3.1



2 marks redraw (2)

3.2



Vector diagram

Tolerance +/- 2 (11)

3.3

MEMBER	MAGNITUDE	NATURE
AE	52 kN✓	Strut✓
BF	29 kN✓	Strut✓
CG	64 kN✓	Strut✓
DE	26 kN✓	Tie✓
DG	32 kN✓	Tie✓
EF	5.5 kN✓	Tie✓
FG	5.5 kN✓	Strut✓

(14)
[27]

QUESTION 4

4.1-4.3

MEMBER	4.1 AREA	4.2 Y-DISTANCE FROM M-M	4.3 AREA × DISTANCE OR MOMENTS
A	60 × 15 = 900 mm^2 ✓	7.5 mm✓	900 mm^2 × 7.5 mm = 6 750 mm^3✓
B	20 × 50 = 1 000 mm^2 ✓	40 mm✓	1 000 mm^2 × 40 mm = 40 000 mm^3✓
C	100 × 15 = 1500 mm^2✓	72.5 mm✓	1 500 mm^2 × 72.5 mm = 108 750 mm^3✓
TOTALS	**= 3 400 cm^2✓**		**= 155 500 cm^3✓✓**

(4 + 3 + 5) (12)

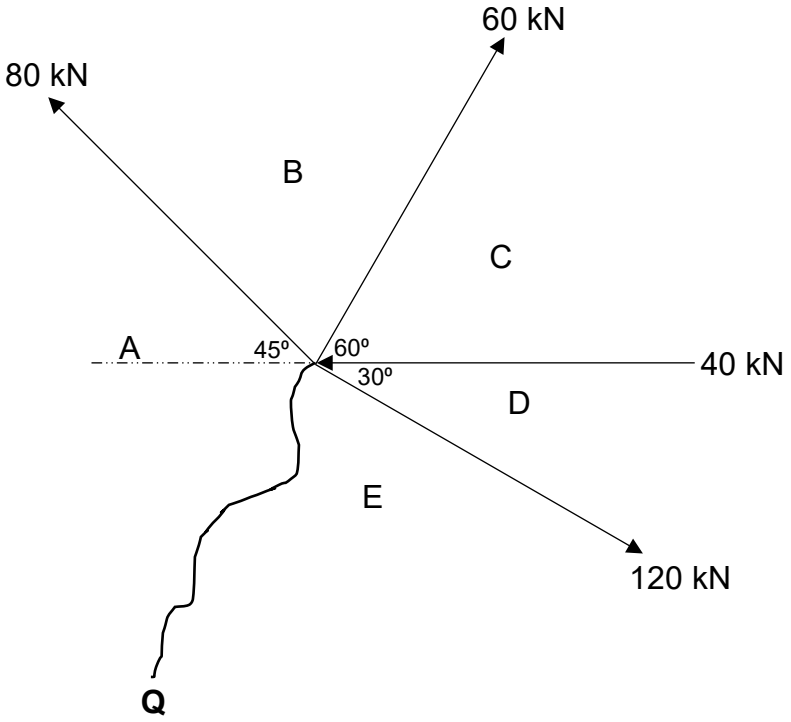
4.4 $\dot{y} = \frac{\text{(TOTAL AREA} \times \text{DISTANCE)}}{\text{TOTAL AREA}}$ ✓

$\dot{y} = \frac{155\,500\ mm^3}{3\,400\ mm^2}$ ✓

$\dot{y}$ = 45.735 m**m**✓✓ (4)
[16]

QUESTION 5

5.1



(3)

5.2

Force	Vertical Component		Horizontal Component	
AB	80 × Sin 45°√	56.569√	80 × Cos 45°√	- 56.569√
BC	60 × Sin 60°√	51.962√	60 × Cos 60°√	30√
CD	40 × Sin 0°√	0√	40 × Cos 0°√	- 40√
DE	120 × Sin 30°√	- 60√	120 × Cos 30°√	103.923√
	∑VC	**48.531**√	**∑HC**	**37.354**√

$R^2 = VC^2 + HC^2$
$R^2 = (48.531)^2 + (37.354)^2$√
$= \mathbf{61.242\ kN}$√

$\tan \alpha = \frac{\sum VC}{\sum HC}$
$\tan \alpha = \frac{48.531}{37.354}$√
$\tan \alpha = 1.299$
$\alpha = \tan^{-1} 1.299$√
$\alpha = 52.410°$√
'Q' = 61.242 kN @ 52.410° (North of East or above horizontal to the right)√

(24 × ½) (12)
[15]

QUESTION 6

6.1 Pushed up,✓ keep up or bring to the surface.✓ (2)

6.2 Absorbent materials:
- Wood
- Sand
- Concrete
- Bricks
- Limestone (Any 2 × 1)

Non-absorbent materials:
- polythene
- Steel
- Copper
- Dense bricks
- Glass
- Slate (Any 2 × 1)

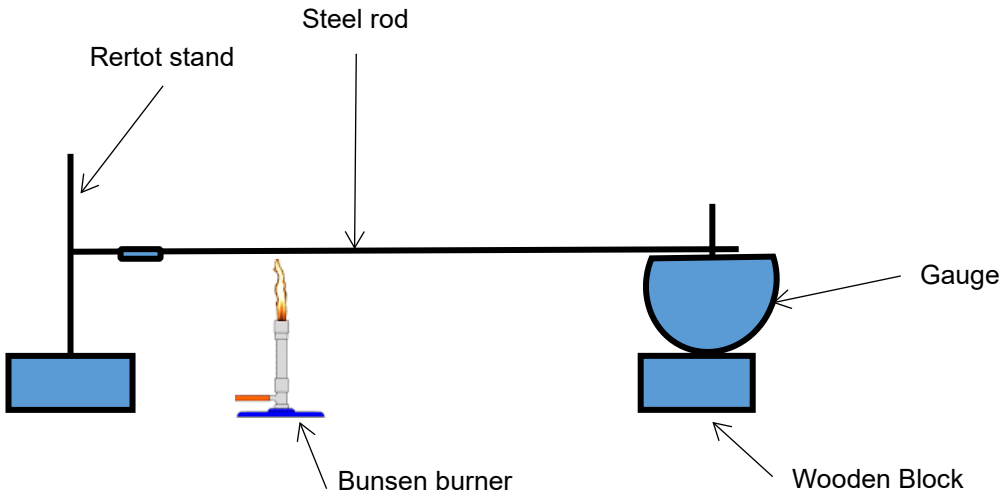
(2 × 2) (4)

6.3 Apparatus:
- Retort stand
- Metal/steel rod
- Bunsen burner
- Needle & gauge
- Wooden block

Method:
- Clamp the rod in stand and fix rod and gauge on wooden block as shown in the sketch.
- Heat the rod.

Observation:
- The movement in the rod's edge will cause the gauge to show a reading.

Conclusion:
- The rod increased in length due to the increase in temperature.



OR any other relevant experiments

Method = 4 × 1mark = 4
Sketch = 4 × ½ mark = 2
Labels = 4 × ½ mark = 2

(8)
[14]

TOTAL: 100

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