



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING SCIENCE N3

30 July 2024

This marking guideline consists of 7 pages.

QUESTION 1

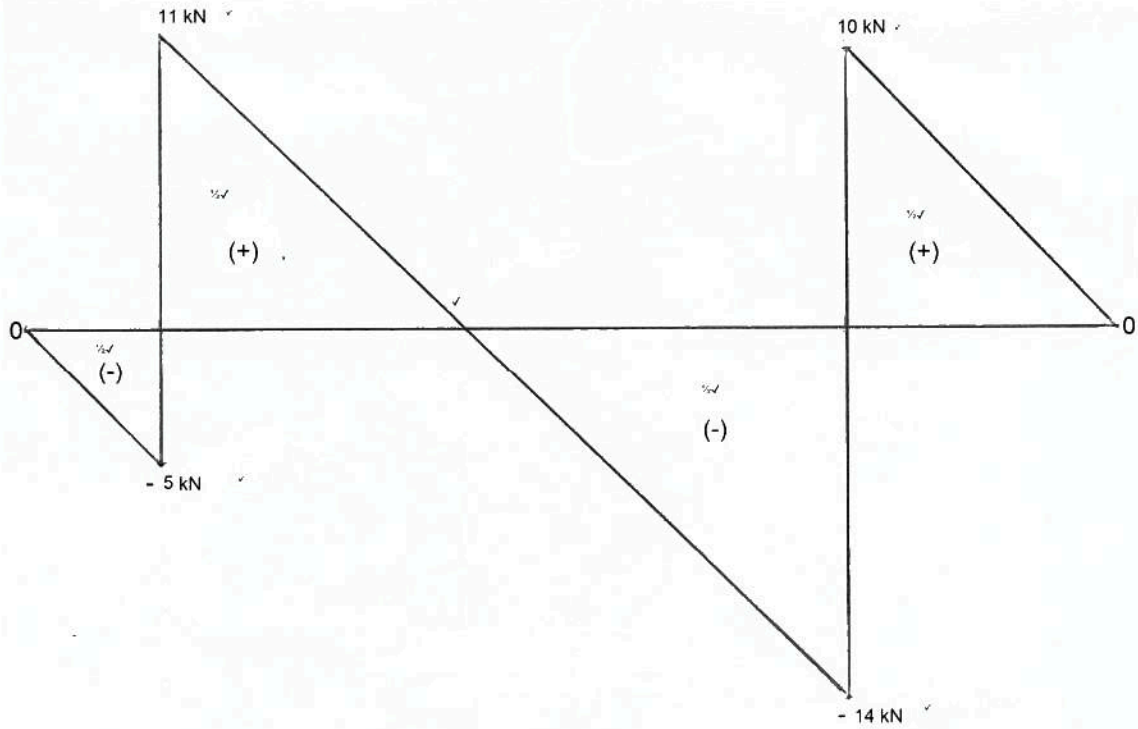
- 1.1 The strength of concrete is inversely proportional to the water-cement ratio.✓
The higher the ratio the lower the strength and vice versa.✓ (2)
- 1.2
- Preliminary treatment✓
 - Coagulation✓
 - Flocculation✓
 - Clarification✓
 - Filtration and Disinfection✓ (5)
- 1.3
- It causes fur to accumulate in metal pipes and boilers.
 - Water obtained from bore holes in hard insoluble rock may contain a percentage of acid.
 - The water may be plumbo-solvent, which means the water easily dissolves lead and copper. (3)

[10]

QUESTION 2

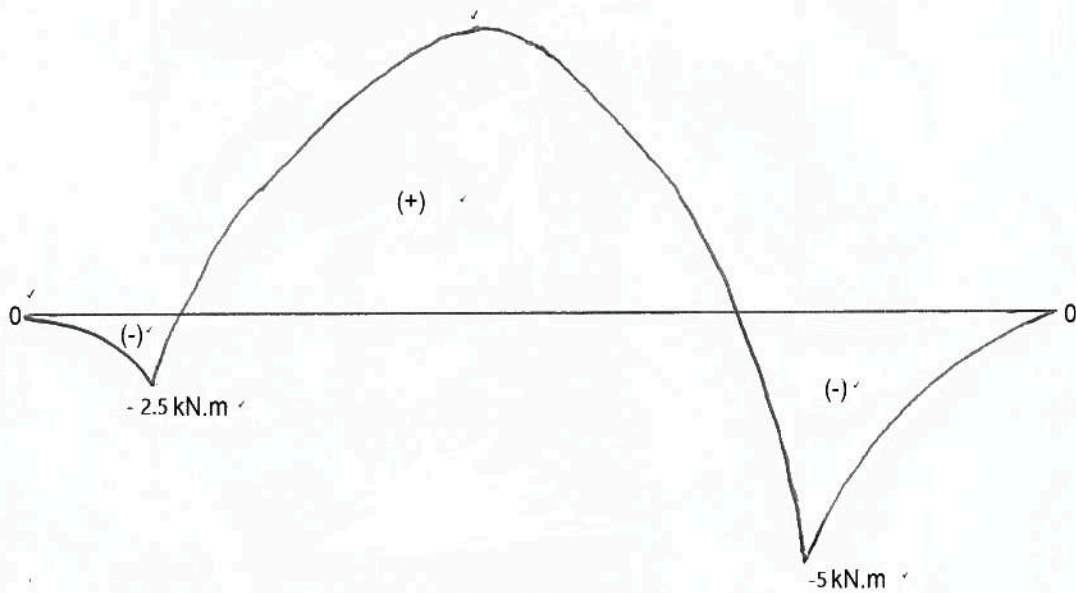
- 2.1 2.1.1 Taking moments at RL (3)
- $$RR \times 5 = 40 \times 3 \checkmark$$
- $$RR = 120/5$$
- $$RR = 24 \text{ kN} \checkmark$$
- 2.1.2 Taking moments at RR (3)
- $$RL \times 5 = 40 \times 2 \checkmark$$
- $$RL = 80/5$$
- $$RL = 16 \text{ kN} \checkmark$$

2.2



(7)

2.3



(7)
[20]

QUESTION 3

- 3.1 The centroid of an area is defined as the point in the object at which the area of the object may be considered to be concentrated.✓✓ (2)

3.2

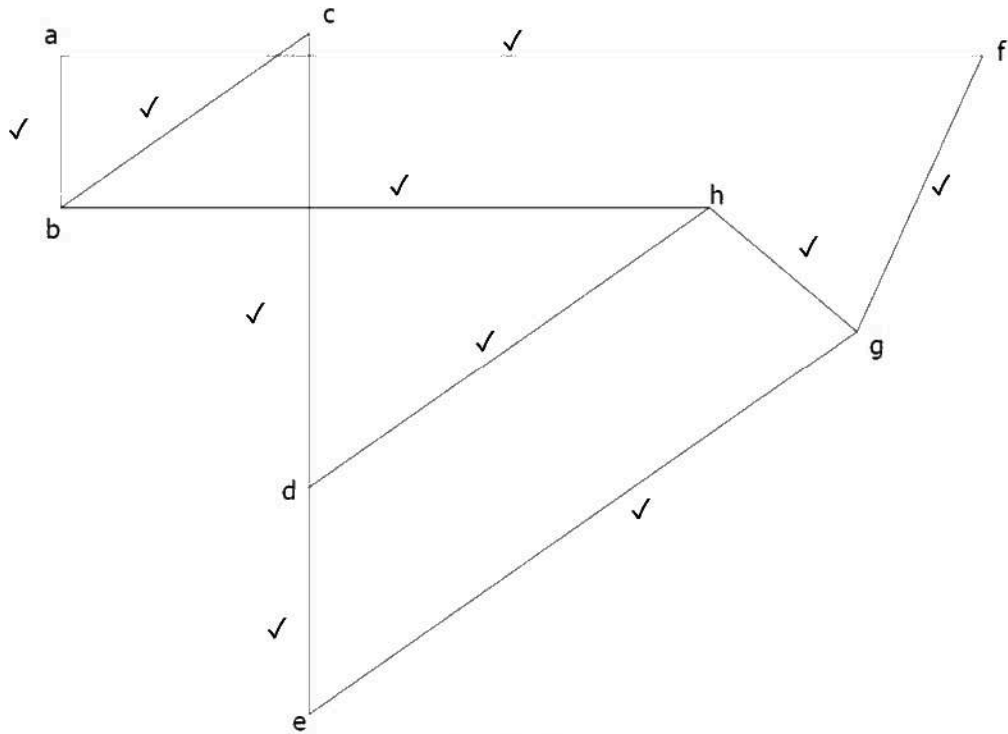
SHAPE	AREA (mm ²)	X (mm)	Y (mm)	AX (mm ³)	AY (mm ³)	
A	250 × 150 = 37 500 ½✓	125 ½✓	75 ½✓	4 687 500 ½✓	2 812 500 ½✓	(2½)
B	0.5 × 150 × 75 = - 5 625 ½✓	225 ½✓	75 ½✓	-1 265 625 ½✓	-421 875 ½✓	(2½)
C	0.5 × 100 × 80 = -4 000 ½✓	90 ½✓	26.67 ½✓	- 360 000 ½✓	-106 680 ½✓	(2½)
D	π × 38 ² /4 = -1134.11 ½✓	40 ½✓	110 ½ ✓	-45364.40 ½✓	-124 752.10 ½✓	(2½)
TOTAL	26 740.89✓			3 016 510.60✓	2 159 192.90✓	(3)

$$\begin{aligned}\bar{x} &= \Sigma x / \Sigma A \frac{1}{2} \checkmark \\ &= 3\,016\,510.60 / 26\,740.89 \checkmark \\ &= 112.81 \text{ mm} \checkmark\end{aligned}$$

$$\begin{aligned}\bar{y} &= \Sigma y / \Sigma A \frac{1}{2} \checkmark \\ &= 2\,159\,192.90 / 26\,740.89 \checkmark \\ &= 80.74 \text{ mm} \checkmark\end{aligned}$$

(5)
[20]

QUESTION 4



(10)

MEMBER	MAGNITUDE (kN)	NATURE
AF	122 $\frac{1}{2}\checkmark$	Tie $\frac{1}{2}\checkmark$
BH	86 $\frac{1}{2}\checkmark$	Tie $\frac{1}{2}\checkmark$
DH	65 $\frac{1}{2}\checkmark$	Strut $\frac{1}{2}\checkmark$
EG	88 $\frac{1}{2}\checkmark$	Strut $\frac{1}{2}\checkmark$
FG	42 $\frac{1}{2}\checkmark$	Strut $\frac{1}{2}\checkmark$
GH	25 $\frac{1}{2}\checkmark$	Tie $\frac{1}{2}\checkmark$

(6)

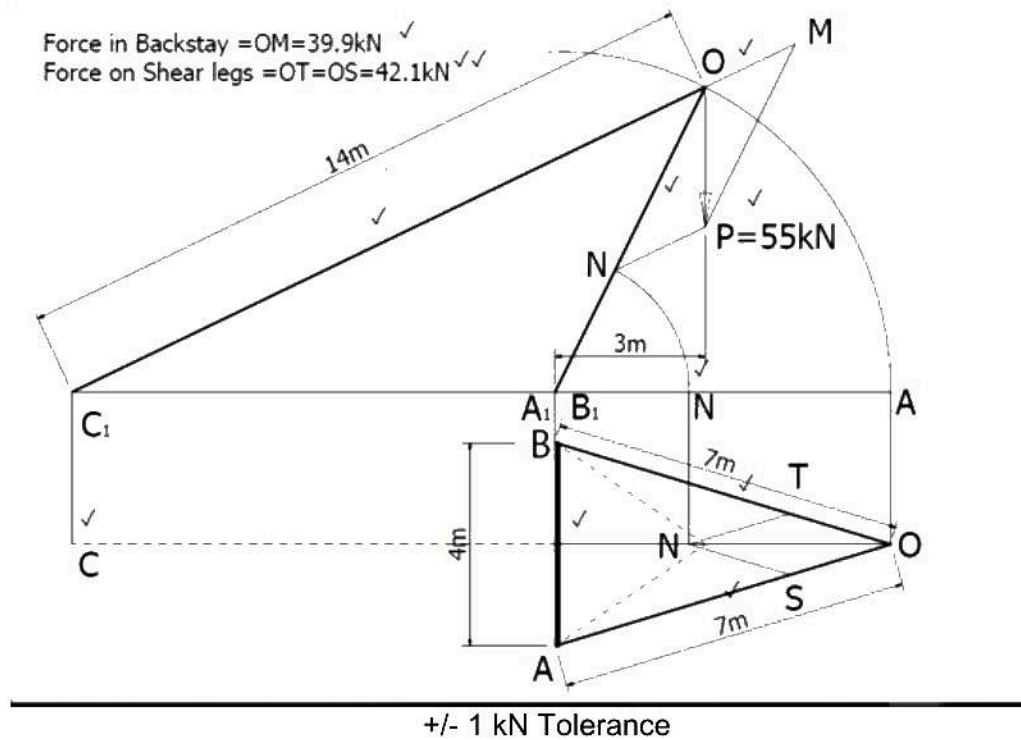
TABLE 1

[16]

NOTE: $\frac{1}{2}$ mark for any correct Magnitude and $\frac{1}{2}$ mark for any Correct Nature in TABLE 1

+/- 2 tolerance for the Magnitude

QUESTION 5



[12]

QUESTION 6

6.1 Gear ratio = $\frac{T_{\text{driven}}}{T_{\text{driver}}}$ ✓
 $= \frac{90}{30}$
 $= 3$ ✓✓

(3)

6.2 Velocity Ratio

$$VR = \frac{2 \times L \times G}{D}$$

$$= \frac{2 \times 0.4 \times 3}{0.5}$$

$$= 4.8$$
 ✓✓

(2)

6.3 $\eta = \frac{MA}{VR} \times 100$
 $98 = \frac{MA}{4.8} \times 100$
 $MA = 4.7$ ✓✓

(2)

6.4 Load = $m \times g$ ✓
 = 60×9.8
 = 588 N ✓✓

MA = $\frac{\text{load}}{\text{Effort}}$
 = $\frac{588}{4.7}$
 = 125.11 N ✓✓

(5)
[12]

QUESTION 7

- 7.1 • Thermoplastics are plastics which can be softened by heat ✓✓
 • Thermosetting plastics are plastics which cannot be softened by heat ✓✓ (4)

7.2 Examples of thermoplastics:

- PVC ✓
- Perspex ✓
- Nylon ✓
- Polystyrene ✓
- Acrylics ✓

(any TWO)

Examples of thermosetting plastics:

- Amino plastics ✓
- Silicones ✓
- Polyurethane ✓
- Polyester ✓
- Melamine ✓

(any TWO) (4)

- 7.3 They have loose electrons in the outer orbit of their atom. ✓ (1)

- 7.4 They do not have loose electrons in the outer orbit of their electrons. ✓ (1)

[10]

TOTAL: 100