



higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

**NATIONAL CERTIFICATE (VOCATIONAL)
APPLIED ENGINEERING TECHNOLOGY
NQF LEVEL 4**

21 November 2023

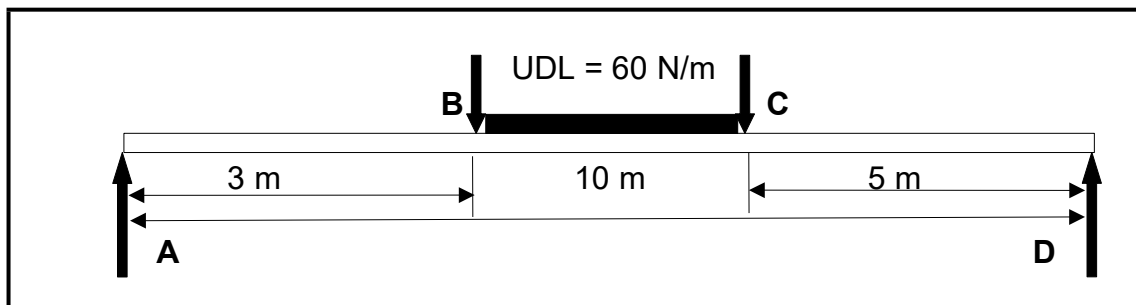
This marking guideline consists of 7 pages.

QUESTION 1

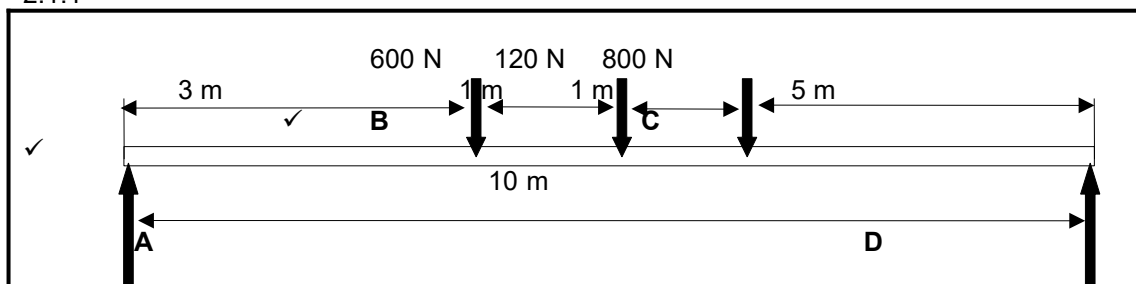
- 1.1
- | | |
|--------|---|
| 1.1.1 | D |
| 1.1.2 | C |
| 1.1.3 | C |
| 1.1.4 | B |
| 1.1.5 | A |
| 1.1.6 | B |
| 1.1.7 | D |
| 1.1.8 | A |
| 1.1.9 | C |
| 1.1.10 | D |
- (10 × 1) (10)
- 1.2
- Provides protection against overload
 - Makes up for some degree of misalignment of the shafts
 - Connects two parts or shaft units that were manufactured separately
 - Provides an easy way to disconnect parts or shaft units for repair and adjustment purposes
 - Allows mechanical flexibility
 - Provides for instantaneous transmission of power/rotation
- (Any 4 × 1) (4)
- 1.3 Mass of cast iron = 90 kg; $\mu_s = 1,1$; $\mu_k = 0,15$; $g = 9,81 \text{ m/s}^2$
- 1.3.1 $F = m \times g$
- $F = 90 \text{ kg} \times 9,81 \text{ m/s}^2 \checkmark$
- Therefore:
- $F = 882,9 \text{ N} \checkmark$
- And:
- $F\mu_s = \mu_s \times F$
- $= 1,1 \times 882,9 \text{ N} \checkmark$
- $= 971,19 \text{ N} \checkmark$ (4)
- 1.3.2 $F\mu_k = \mu_k \times F$
- $= 0,15 \times 882,9 \text{ N} \checkmark$
- $= 132,435 \text{ N} \checkmark$ (2)
- [20]**

QUESTION 2

2.1



2.1.1



(2)

2.1.2

Take moments about support A:

Sum of clockwise moments = sum of anticlockwise moments

$$\begin{aligned}
 &\checkmark \quad \checkmark \quad \checkmark \quad \checkmark \\
 &600 \times 3 + 120 \times 4 + 800 \times 5 = D \times 10 \\
 &1\,800 + 480 + 4\,000 = 10D \\
 &6\,280 = 10D \\
 &D = 628 \text{ N} \checkmark
 \end{aligned}$$

Take moments about support D:

Sum of clockwise moments = sum of anticlockwise moments

$$\begin{aligned}
 &\checkmark \quad \checkmark \quad \checkmark \quad \checkmark \\
 &A \times 10 = 800 \times 5 + 120 \times 6 + 600 \times 7 \\
 &10A = 4\,000 + 720 + 4\,200 \\
 &A = 892 \text{ N} \checkmark
 \end{aligned}$$

(10)

2.1.3

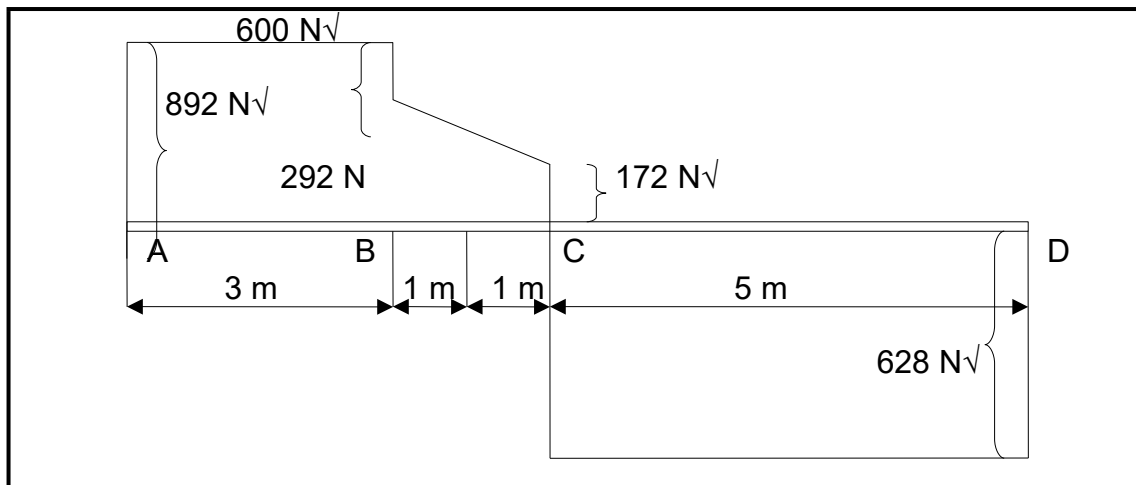
Upward forces = Downward forces

$$628 + 892 = 600 + 120 + 800 \checkmark$$

$$1\,520 \text{ N} = 1\,520 \text{ N} \checkmark$$

(2)

2.2



(2)

2.3 Bending moment at:

$$A = 0 \text{ Nm} \checkmark$$

$$B = 892 \times 3 = 2\,676 \text{ Nm} \checkmark$$

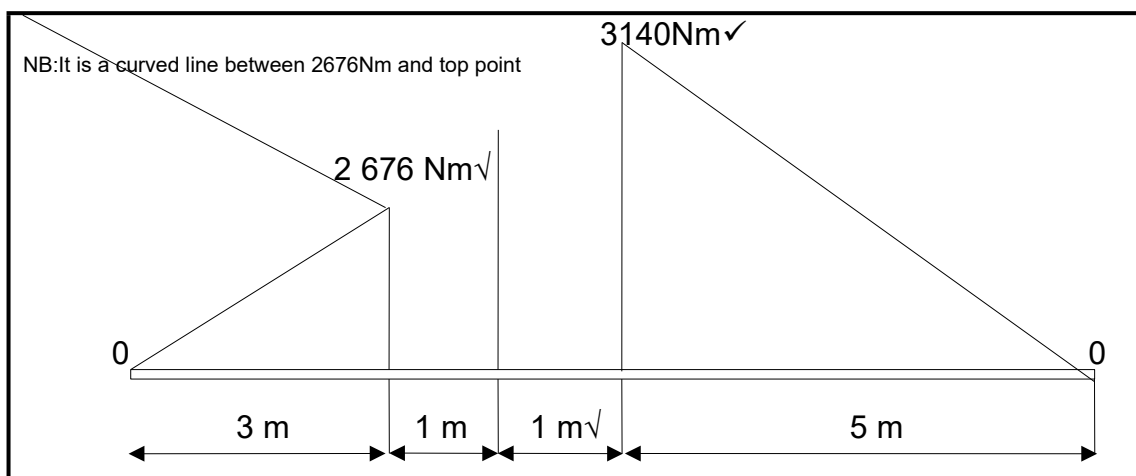
$$C = 628 \times 5 = 3\,140 \text{ Nm} \checkmark$$

$$D = 0 \text{ Nm} \checkmark$$

 $(\frac{1}{2} \times 4)$

(2)

2.4



(2)

2.5 Maximum bending moment = 3 140 N at 5 m from the RHS

(2)

[22]

QUESTION 3

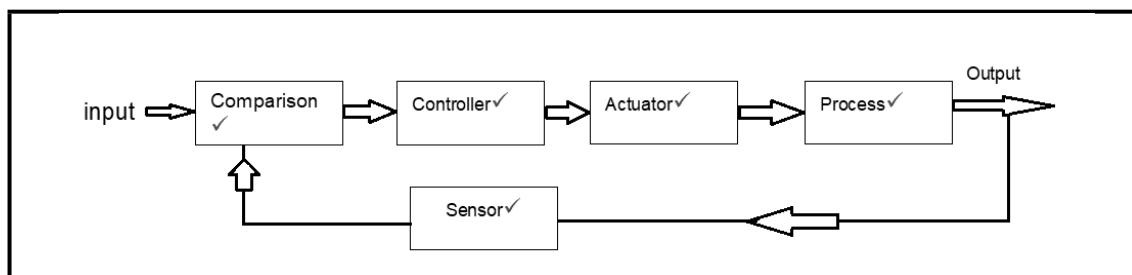
3.1	3.1.1	H		
	3.1.2	L		
	3.1.3	B		
	3.1.4	J		
	3.1.5	A		
	3.1.6	C		
	3.1.7	D		
	3.1.8	E		
	3.1.9	F		
	3.1.10	G		
			(10 × 1)	(10)
3.2	• Actuator			
	• Controller			
	• Process			
	• Sensor			(4)
3.3	• Brushes			
	• Axle			
	• Electromagnet/Solenoid			
	• Commutator			
	• Armature/Rotor		(Any 2 × 1)	(2)
3.4	• It makes the design visual.			
	• It helps communicate ideas.			
	• It is used to document designs.		(Any 2 × 1)	(2)
				[18]

QUESTION 4

- 4.1.1 ✓ ✓
solid, gas and liquid. ✓ (3)
- 4.1.2 ✓
When the refrigeration cycle becomes too hot e.g. in the inside of a ✓ refrigerator, the
thermostat switches the power on and when it gets too cold it cuts the ✓ power supply. ✓ (4)
- 4.1.3 ✓ ✓ ✓
convection, radiation and conduction (3)
- 4.2 • Mechanical
• Pneumatic
• Hydraulic
• Electrical (4)
- 4.3 4.3.1 It is a movement in a straight line, backwards and forwards or up and down e.g.
piston in an engine. (2+1)
- 4.3.2 Oscillating motion is an object that swings backwards and forwards in an arc e.g.
a pendulum. (2+1) (6)
- 4.4 Digital signal is a signal that varies in steps. (1)
- 4.5 A vacuum is an empty space. Matter is anything that occupies space and has mass. (2 + 2) (4)
- [25]**

QUESTION 5

5.1



(5)

- 5.2
- Accuracy required
 - Speed of response
 - Availability of finance

(3)

- 5.3 A prototype is a model or design that is built to test if the concept can work.

(2)

- 5.4
- | | |
|-------|-------|
| 5.4.1 | False |
| 5.4.2 | False |
| 5.4.3 | True |
| 5.4.4 | True |
| 5.4.5 | True |

(5 × 1) (5)
[15]

TOTAL: 100