



higher education
& training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

BUILDING AND STRUCTURAL CONSTRUCTION N5

17 February 2022

This marking guideline consists of 10 pages.

QUESTION 1

1.1 THE REACTIONS

Take moments about RR:

$$(RL \times 10,5) = (16 \times 13) + (7 \times 5,5 \times 10,25) + (17,5 \times 7,5) + (8 \times 5,5) + (5 \times 3,5) + (3 \times 5,5 \times 2,75) \quad \checkmark$$

$$RL = \frac{(208 + 394,625 + 131 + 44 + 45,375)}{10,5} = \left(\frac{823}{10,5} \right)$$

$$RL = 78,4 \text{ kN } (78,38 \text{ kN}) \quad \checkmark \quad (2)$$

1.2 Shear-force diagram = 2 marks (Diagram given after QUESTION 1.5.) (2)

SHEAR FORCE VALUES

SF A: -16 kN	-16 kN
SF B: -16 kN - (7 × 2,5)	-33,5 kN
SF B: -16 kN - (7 × 2,5) + 78,4 kN	44,9 kN (Max)✓
SF C: -16 kN - (7 × 5,5) + 78,4 kN	23,9 kN
SF C: -16 kN - (7 × 5,5) - 17,5 kN + 78,4 kN	6,4 kN
SF D: -16 kN - (7 × 5,5) - 17,5 kN + 78,4 kN	6,4 kN ✓
SF D: -16 kN - (7 × 5,5) - 17,5 kN - 8 kN + 78,4 kN	-1,6 kN
SF E: -16 kN - (7 × 5,5) - 17,5 kN - 8 kN - (3 × 5,5) + 78,4 kN	-18,1 kN ✓
SF E: (78,4 kN + 29,1 kN) - 16 kN - (7 × 5,5) - 17,5 kN - 8 kN - (3 × 5,5)	11 kN (3)

1.3 BENDING MOMENT VALUES

$$BM B: -(16 \times 2,5) - (7 \times 2,5 \times 1,25) \quad -61,875 \text{ kNm } \checkmark$$

$$BM C: (78,4 \times 3) - (16 \times 5,5) - (7 \times 5,5 \times 2,75) \quad 41,325 \text{ kNm } \checkmark$$

$$BM D: (29,1 \times 5,5) - (11 \times 5,5) - (3 \times 5,5 \times 2,75) \text{ (Max)} \quad 54,175 \text{ kNm } \checkmark$$

OR

$$BM D: (78 \times 5) - (16 \times 7,5) - (7 \times 5,5 \times 4,75) - (17,5 \times 2) \quad 54,175 \text{ kNm } (3)$$

1.4 SECTION MODULUS AND SUITABLE H-SECTION PARALLEL FLANGE STEEL BEAM

$$Z_e = \frac{B M \max}{Stress} = \frac{54,175 \times 10^6}{158} = 342\,789,14 \text{ mm}^3 \quad \checkmark$$

$$Z_e = 342,8 \times 10^{-6} \text{ m}^3 \quad \checkmark$$

Select: 203 × 203 × 46,2 = 5 kg/m H-section parallel flange

$$(Z_e = 449,3 \times 10^{-6}) \quad \checkmark \quad (3)$$

1.5 SHEAR STRESS OF CHOSEN BEAM

$$\text{Shear stress} = \frac{SF_{max}}{D \times t_1} = \frac{44,9 \times 10^3}{203,2 \times 7,3} = 30,27 \text{ MPa} \checkmark \checkmark$$

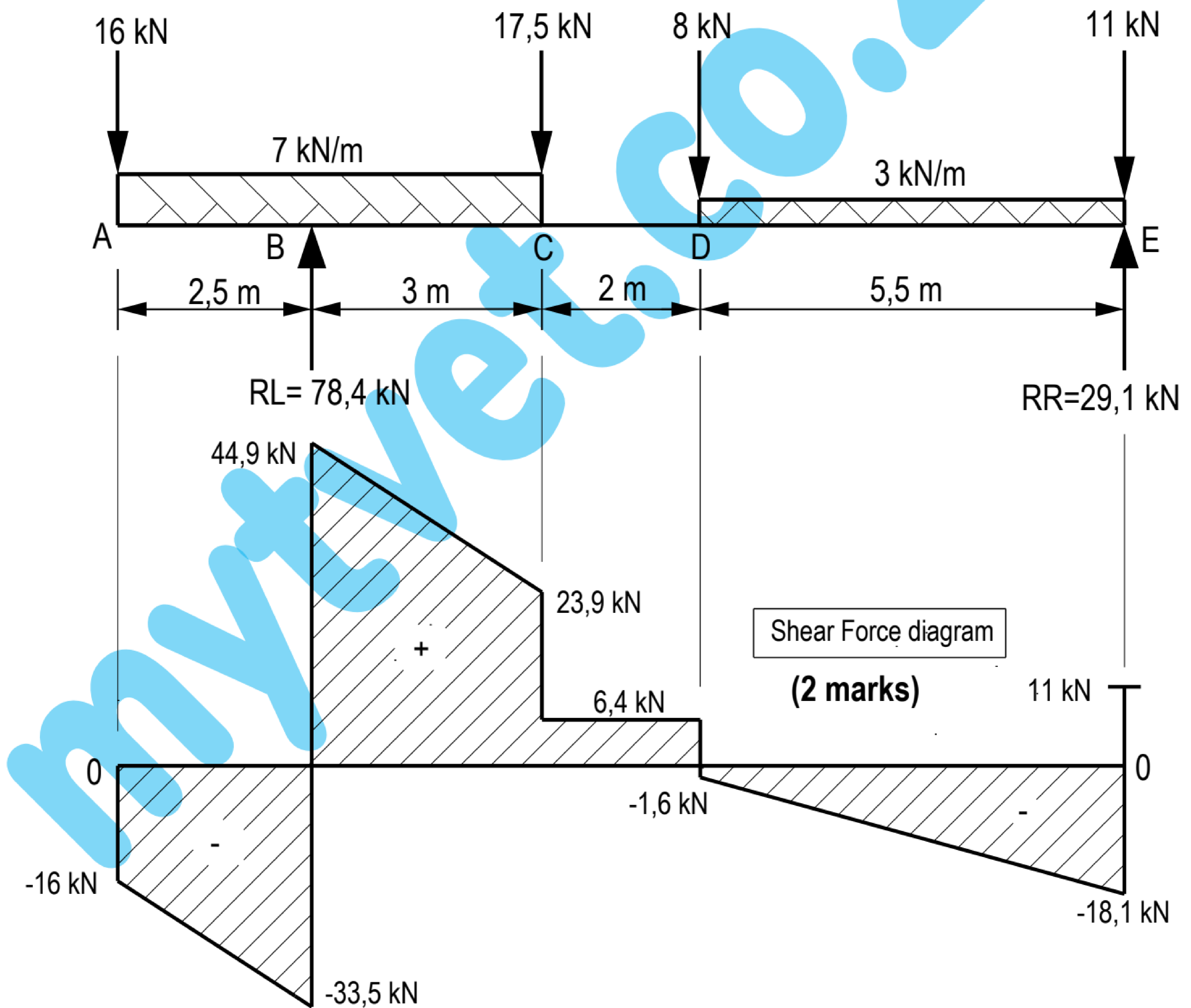
$$Z_e = 30,27 < 100 \text{ MPa} \checkmark$$

(3)

1.2 SHEAR-FORCE DIAGRAM

Space Diagram

Scale: 140 mm = 13 m



[16]