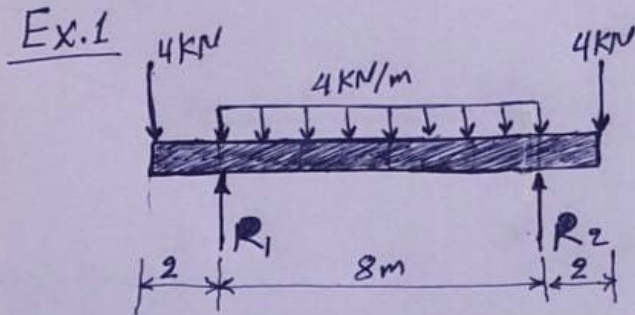
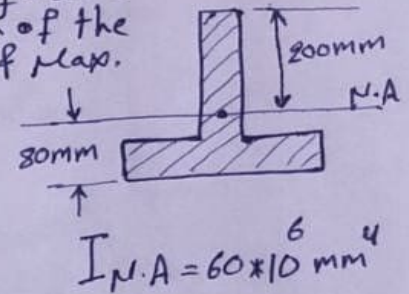


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Unsymmetrical sections (Economic sections)

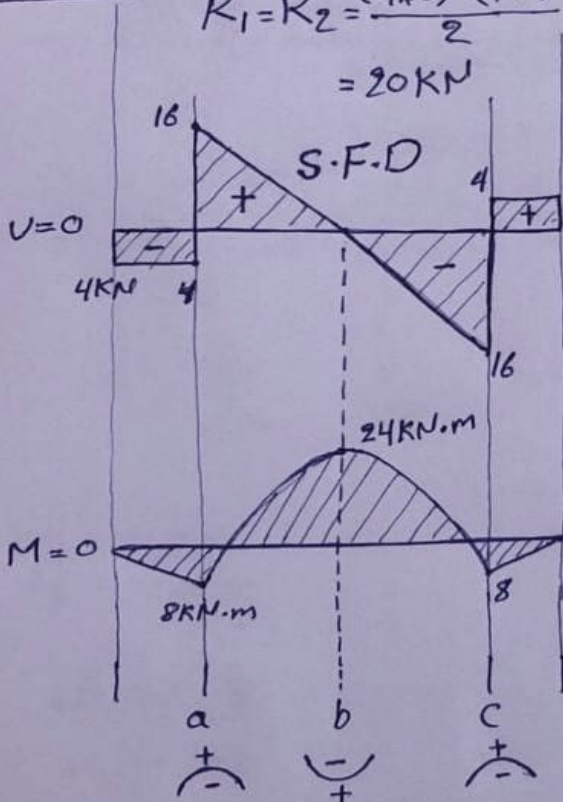


- Find the magnitude and location of the Max. tensile & Max. Compressive bending stress?



Solution:

$$R_1 = R_2 = \frac{(4 \times 8) + (4 \times 2)}{2} = 20 \text{ kN}$$



$$\text{max. } \sigma_b = \frac{M \cdot y}{I_{N.A}}$$

For sec. a & c; at the top.

$$\text{max. } \sigma_b = \frac{(8 \times 10^3)(0.2)}{60 \times 10^6 \times 10^{-12}} = \boxed{26.6 \text{ MPa}} \text{ Ten.}$$

- at the bottom

$$\text{max. } \sigma_b = \frac{(8 \times 10^3)(0.08)}{60 \times 10^6 \times 10^{-12}} = \boxed{10.7 \text{ MPa}} \text{ Comp.}$$

For sec. b

at the top.

$$\text{max. } \sigma_b = \frac{(24 \times 10^3) \times 0.2}{60 \times 10^6 \times 10^{-12}} = \boxed{80 \text{ MPa}} \text{ Comp.}$$

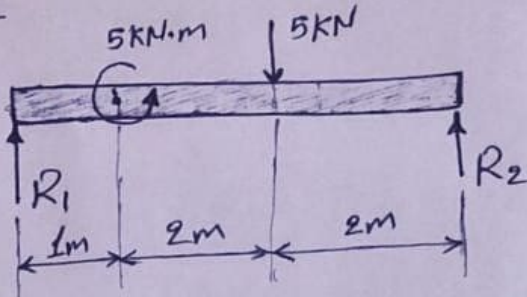
at the bottom

$$\text{max. } \sigma_b = \frac{(24 \times 10^3)(0.08)}{60 \times 10^6 \times 10^{-12}} = \boxed{32 \text{ MPa}} \text{ Ten.}$$

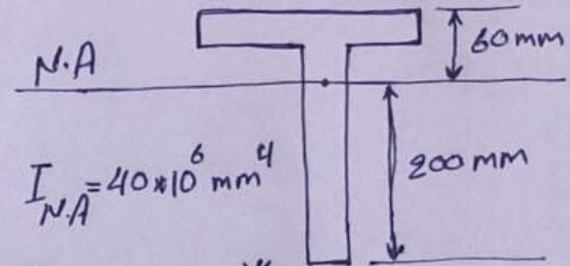


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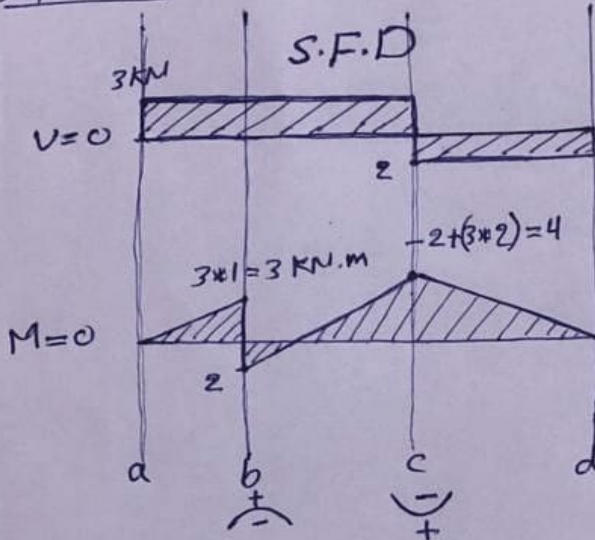
Ex. 2



Find the magnitude and location of the Max. σ_b in Ten. an Comp.



Solution:



Determination of R_1 & R_2

$$\sum M_{R_2} = \text{Zero}$$

$$5 \times 2 + 5 - 5R_1 = \text{Zero}$$

$$\therefore R_1 = 3 \text{ kN}$$

$$\sum F_y = \text{Zero}$$

$$3 + R_2 = 5 \Rightarrow R_2 = 2 \text{ kN}$$

$$\sigma_b = \frac{M \cdot y}{I_{N.A}}$$

at sec. b
at the top

$$\text{max. } \sigma_b = \frac{(2 \times 10^3)(0.06)}{40 \times 10^6 \times 10^{-12}} = 3 \text{ MPa}$$

Ten.

at the bottom

$$\text{max. } \sigma_b = \frac{(2 \times 10^3)(0.02)}{40 \times 10^6 \times 10^{-12}} = 10 \text{ MPa}$$

Comp.

at sec. c

at the top.

$$\text{max. } \sigma_b = \frac{(4 \times 10^3)(0.06)}{40 \times 10^6 \times 10^{-12}} = 6 \text{ MPa}$$

Comp.

at the bottom.

$$\text{max. } \sigma_b = \frac{(4 \times 10^3)(0.02)}{40 \times 10^6 \times 10^{-12}} = 20 \text{ MPa}$$

Ten.