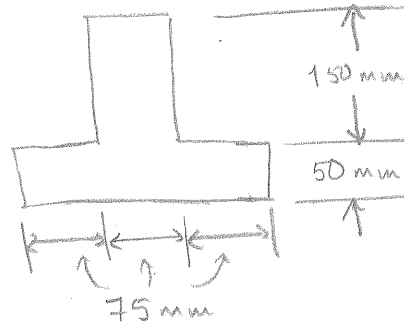
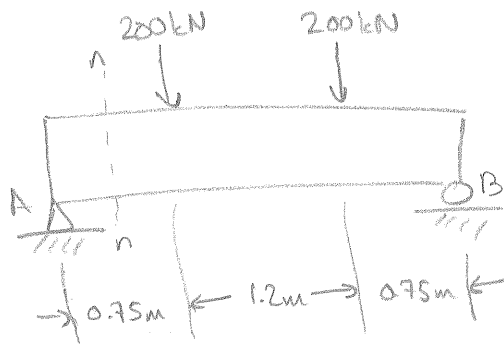


13.19)



Find τ_{max} at section n-n

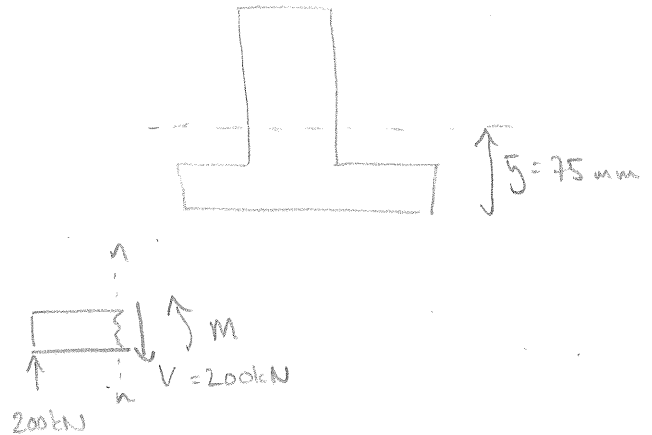
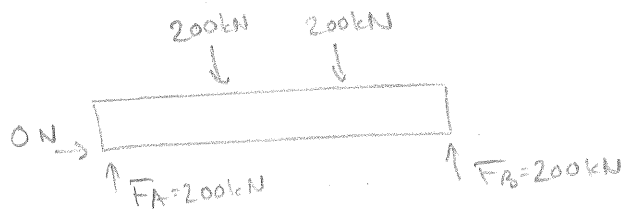
$$\bar{y} = \frac{3(75\text{mm})(50\text{mm})(25\text{mm}) + (150\text{mm})(75\text{mm})(75\text{mm} + 50\text{mm})}{3(75\text{mm})(50\text{mm}) + (150\text{mm})(75\text{mm})}$$

$$\bar{y} = 75\text{mm}$$

$$I = \frac{1}{12}(3.75\text{mm})(50\text{mm})^3 + (75\text{mm} - 25\text{mm})^2(3.75\text{mm})(50\text{mm}) + \frac{1}{12}(75\text{mm})(150\text{mm})^3 + (75\text{mm} + 50\text{mm} - 75\text{mm})^2(75\text{mm})(150\text{mm})$$

$$I = 79.69 \cdot 10^6 \text{mm}^4 = 79.69 \cdot 10^{-6} \text{m}^4$$

τ_{max} will occur at neutral axis for this cross section



$$\tau_{max} = \frac{VQ}{It}$$

$$Q = \sum y_i A_i = \frac{1}{2}(25\text{mm})(25\text{mm})(75\text{mm}) + (50\text{mm})(50\text{mm})(3.75\text{mm})$$

$$Q = 585.9 \cdot 10^3 \text{mm}^3 = 585.9 \cdot 10^{-6} \text{m}^3$$

$$\tau_{max} = \frac{(200 \cdot 10^3 \text{N})(585.9 \cdot 10^{-6} \text{m}^3)}{(79.69 \cdot 10^{-6} \text{m}^4)(0.075\text{m})} = 19.6 \cdot 10^6 \frac{\text{N}}{\text{m}^2}$$

$$\tau_{max} = 19.6 \text{MPa}$$