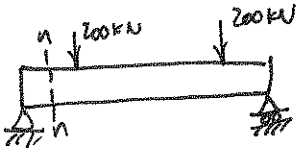
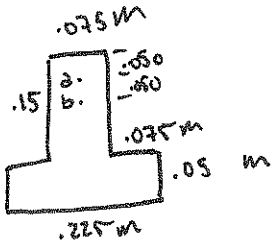
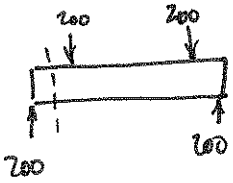
13.17. Solution

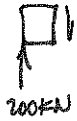




Find shear stress at a and b on section n-n.

FBD:



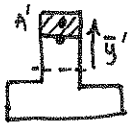


$\Sigma F_y = 0 \Rightarrow V = 200\ kN$

Find neutral axis: $\bar{y} = \frac{\Sigma A_i y_i}{\Sigma A_i} = \frac{(.075)(.15)(.075) + (.225)(.05)(.175)\ m^3}{(.075)(.15) + (.225)(.05)\ m^2}$ (from top)

$\bar{y} = .125\ m$ from top.

a:



$A' = (.075)(.05)\ m^2 = .00375\ m^2$

$\bar{y}' = .125\ m - .025\ m = .1\ m$

$t = .075\ m$

$I = \Sigma I + Ad^2 = \frac{(.075)(.15)^3}{12}\ m^4 + (.075)(.15)(.05)^2\ m^4 + \frac{(.225)(.05)^3}{12} + (.225)(.05)(.05)^2$

$I = 7.97 \cdot 10^{-5}\ m^4$

$\tau_a = \frac{VA'\bar{y}'}{It} = \frac{(200\ kN)(.00375)(.1)}{(7.97 \cdot 10^{-5}\ m^4)(.075)\ m} = \boxed{12.5\ MPa}$

b:

$A' = (.075)(.1)\ m^2 = .0075\ m^2$

$\bar{y}' = .125\ m - .05\ m = .075\ m$

$t = .075\ m$

I = same as above

$\tau_b = \frac{VA'\bar{y}'}{It} = \frac{(200\ kN)(.0075)(.075)\ m}{(7.97 \cdot 10^{-5})(.075)\ m} = \boxed{18.8\ MPa}$