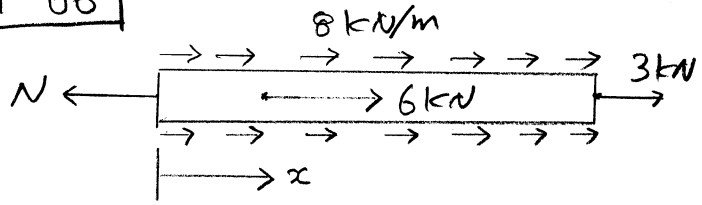
12-331 Solid Mechanics
HW #1 Due: 9/5/00

1-66



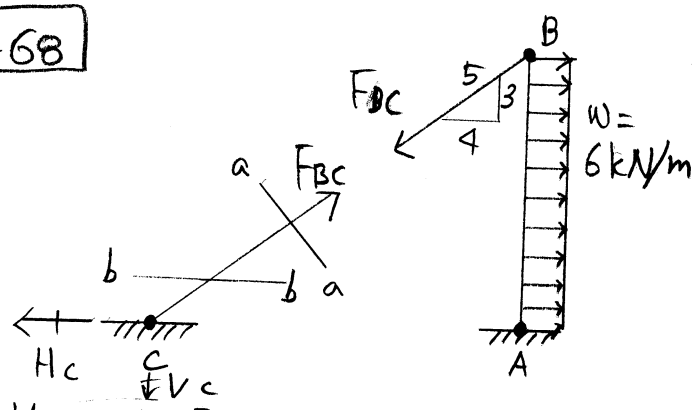
$\Sigma F_x = 0$; $-N + 8(1.25 - x) + 3 + 6 = 0$

$N = (19 - 8x)$ kN

$$\sigma = \frac{N}{A} = \frac{(19 - 8x)10^3}{400(10^{-6})}$$

$$= \underline{47.5 - 20x \text{ MPa}}$$

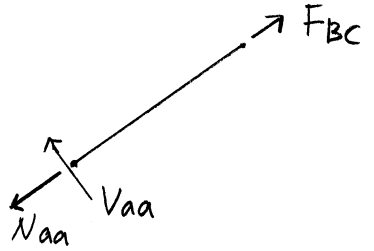
1-68



$\Sigma M_A = 0$; $F_{BC} \cdot \frac{4}{5}(3) - (6)(3)\left(\frac{3}{2}\right) = 0$

$F_{BC} = 11.25$ kN

(Section a–a)

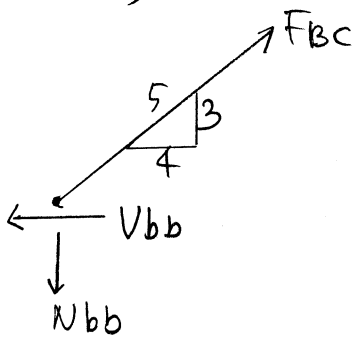


$N_{aa} = F_{BC} = 11.25$ kN; $V_{aa} = 0$

$$\sigma_{aa} = \frac{N_{aa}}{A_{aa}} = \frac{(11.25)(10^3)}{(0.9)(10^{-3})} = \underline{12.5 \text{ MPa}}$$

$$\tau_{aa} = \frac{V_{aa}}{A_{aa}} = \underline{0 \text{ MPa}}$$

(Section b–b)



$\Sigma F_x = 0$; $V_{bb} - F_{BC}\frac{4}{5} = 0$

$\underline{V_{bb} = 9.0 \text{ kN}}$

$\Sigma F_y = 0$; $N_{bb} - F_{BC}\frac{3}{5} = 0$

$\underline{N_{bb} = 6.15 \text{ kN}}$

$$\sigma_{bb} = \frac{N_{bb}}{A_{bb}} = \frac{6.15 \times 10^3}{1.5(10^{-3})} = \underline{4.5 \text{ MPa}}$$

$$\tau_{bb} = \frac{V_{bb}}{A_{bb}} = \frac{9.0(10^3)}{1.5(10^{-3})} = \underline{6.0 \text{ MPa}}$$