SOLUTION (5.4)

$$I_y = 2[\tfrac{30\times8^3}{12} + 240\times34^2] + \tfrac{8\times76^3}{12} = 85(10^4)\ mm^4$$

$$I_z = 2[\tfrac{30\times8^3}{12} + 240\times19^2] + \tfrac{76\times8^3}{12} = 21.2(10^4)\ mm^4$$

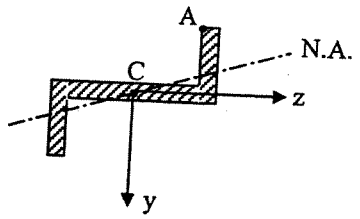
$$I_{yz} = [0 + 240(19)(-34)] + [0 + 240(-19)(34) + 0 = -31(10^4)\ mm^4$$

Using Eq. (5.14):

$$M_o[21.2 + 1.5(-31)]z = M_o[-31 + 1.5\times85]y$$

or $z = -3.81y$

Thus, point A is the farthest from the N.A., as shown.



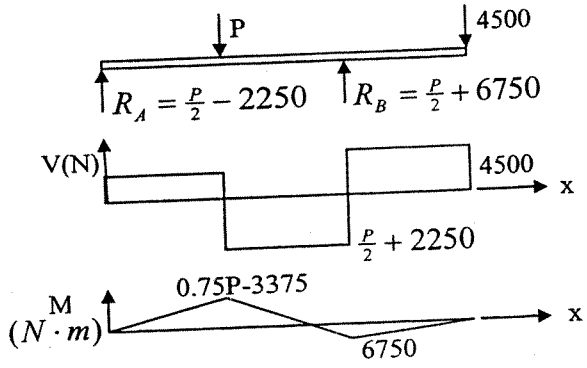
Hence, Eq. (5.13) gives

$$(\sigma_x)_A = 80(10^6) = \frac{[21.2+1.5(-31)]0.03-[-31+1.5(85)](-0.034)}{[85\times21.2-(-31)^2]10^{-8}} M_o$$

from which

$$M_o = 266.8\ N\cdot m$$

SOLUTION (5.14)



We have

$$I = \frac{0.2(0.25)^3}{12} - \frac{0.15(0.2)^3}{12} = 160.417(10^{-6})\ m^4$$

Then,

$$\tau = \frac{VQ}{Ib} = 0.7(10^6)$$

$$= \frac{(P/2)+2250)}{160.417\times10^{-6}(0.05)}(0.2\times0.025\times0.1125 + 0.1\times0.05\times0.05)(2)$$

Solving,

$$P = 9.32\ kN$$

Similarly,

$$\sigma = \frac{Mc}{I} = 7(10^6) = \frac{(0.75P-3375)(0.125)}{160.417\times10^{-6}}$$

or

$$P = 16.478\ kN$$