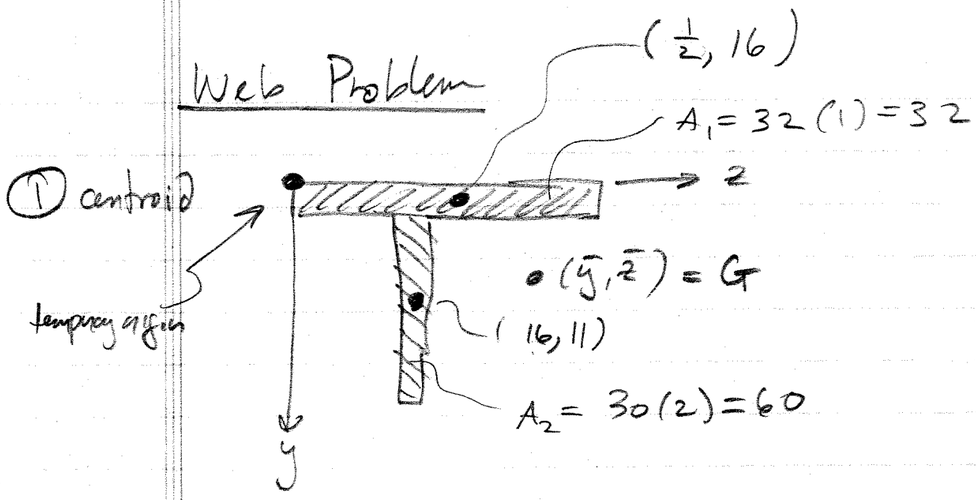
Web Problem



$$(32+60)\bar{y} = 32\left(\tfrac{1}{2}\right) + 60(16)$$
$$(32+60)\bar{z} = 32(16) + 60(11)$$
$$\Big\} (\bar{y}, \bar{z}) = (10.61, 12.74)$$

(2) $I = I_{\square} + I_{\square} = \frac{1}{12}(32)(1)^3 + (32)(10.61 - \frac{1}{2})^2 + \frac{1}{12}(2)(30)^3 + (60)(16 - 10.61)^2$

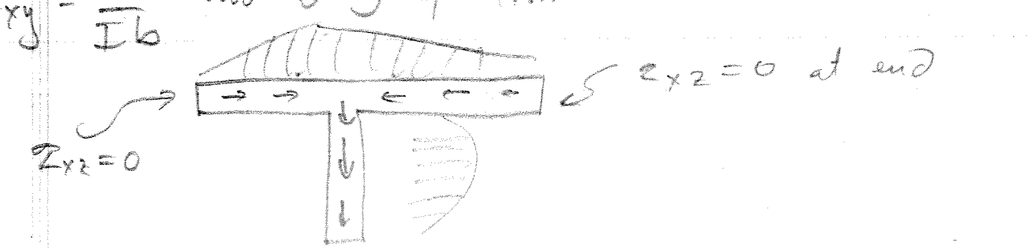
$= 3273.45 + 6243.13 = 9516.58$

(3) $Q = \bar{y}_{A^*} A^* = (10.61)(0) = 0$

(4) $Q = \bar{y}_{A^*} A^* = (31 - 10.61 - \frac{5}{2})(5)(2) = 178.9$

(5) $\tau_{xy} = \frac{QV}{Ib}$ and b jumps from 2 → 32 at C

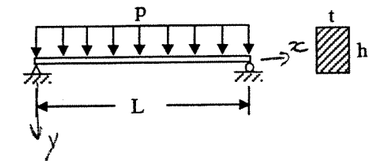
(6)



SOLUTION (5.13)

$\tau_{max} = \frac{VQ}{Ib} = \frac{pL}{2}\frac{(th/2)(h/4)}{(th^3/12)t} = \frac{3}{4}\frac{pL}{ht}$ at $y = 0$ and either $x = 0$ or $x = L$

$\sigma_{max} = \frac{Mc}{I} = \frac{pL^2}{8}\frac{h/2}{th^3/12} = \frac{3}{4}\frac{pL^2}{th^2}$ at $x = \frac{L}{2}$ and $y = \pm\frac{h}{2}$



Thus,

$$\frac{\sigma_{max}}{\tau_{max}} = \frac{L}{h}$$

from which

$$L = \frac{\sigma_{max} h}{\tau_{max}} = \frac{8.4(0.15)}{0.7} = 1.8\ m$$

Then,

$$p = \frac{4}{3}\frac{\tau_{max}(th)}{L} = \frac{4}{3}\frac{700(0.05 \times 0.15)}{1.8}$$
$$= 3.88\ kN \cdot m$$