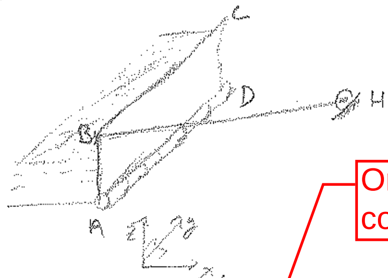
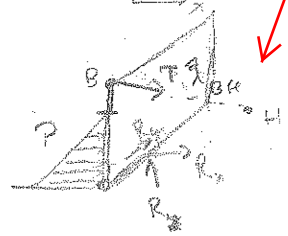
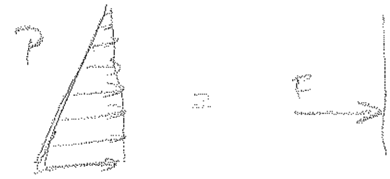
8.1.3



Origin at lower left corner, z is up.



hinge reaction forces



F is the equivalent point force for pressure

$$P = \gamma(3m - z)$$

$$F = \int_A P\,dA = \int_0^{3m} \gamma(3m - z)\ 12m\,dz$$

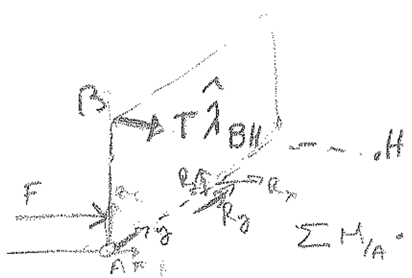
$$= 12m\,\gamma\left(3m\,z - \tfrac{1}{2}z^2\Big|_0^{3m}\right)$$

$$= \tfrac{1}{2}(12m)(3m)^2\gamma = 54\,m^3 \cdot \gamma$$

$$F = 54\ kN$$

$$\bar{z} = \frac{\int z\,dF}{\int dF} = \frac{12m\,\gamma\int_0^{3m}(3m - z)z\,dz}{\tfrac{1}{2}(12m)\gamma(3m)^2} = \frac{\frac{3m}{2}z^2 - \frac{z^3}{3}\Big|_0^{3m}}{\tfrac{1}{2}(3m)^2}$$

$$= \left(\frac{3m}{2} - \frac{3m}{3}\right)\cdot 2 = 1m$$



$$\Sigma M_{/A} \cdot \hat{y} = F(1m) + T_x(4m) = 0$$

$$T_x = -\frac{F}{4}$$

$$T\hat{\lambda}_{BH} = T_x\hat{i} + T_y\hat{j} + T_z\hat{k} = T\,(3\hat{i} + 12\hat{j} - 4\hat{k})\frac{1}{\sqrt{3^2 + 12^2 + (-4)^2}}$$

$$= \frac{T}{13}(3\hat{i} + 12\hat{j} - 4\hat{k})$$

$$T\hat{\lambda}_{BH} \cdot \hat{i} = T_x = T\,\frac{3}{13}$$

$$T = \frac{13}{3}T_x$$

$$= -\frac{13F}{12} = \boxed{-58.5\ kN = T}$$

T is the Tension in rod BH