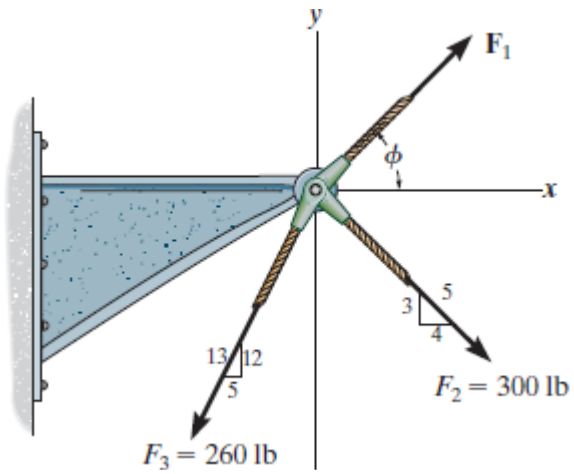
Name: ……

Serial number: …… ***Section:*** ……

Quistion: 1 ***(8marks)***

Determine the magnitude and direction of the resultant force acting on the bracket (take F_1= 250 Ib,and Φ= 30^o)



$(F_1)_x = 250\cos 30° = 216.51$ lb $\quad (F_1)_y = 250\sin 30° = 125$ lb

$(F_2)_x = 300\left(\frac{4}{5}\right) = 240$ lb $\quad (F_2)_y = 300\left(\frac{3}{5}\right) = 180$ lb

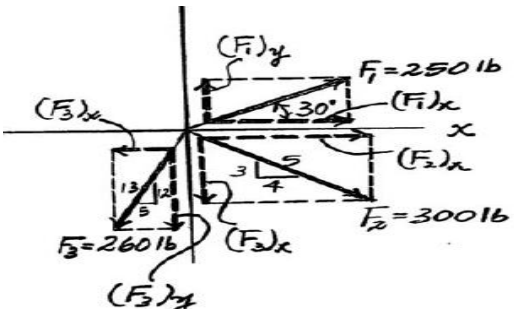
$(F_3)_x = 260\left(\frac{5}{13}\right) = 100$ lb $\quad (F_3)_y = 260\left(\frac{12}{13}\right) = 240$ lb

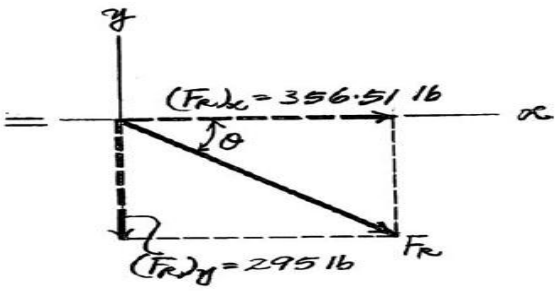
$\stackrel{+}{\rightarrow}\Sigma(F_R)_x = \Sigma F_x; \quad (F_R)_x = 216.51 + 240 - 100 = 356.51$ lb $\rightarrow$

$+\uparrow\Sigma(F_R)_y = \Sigma F_y; \quad (F_R)_y = 125 - 180 - 240 = -295$ lb $= 295$ lb $\downarrow$

$$\theta = \tan^{-1}\left[\frac{(F_R)_y}{(F_R)_x}\right] = \tan^{-1}\left(\frac{295}{356.51}\right) = 39.6°$$

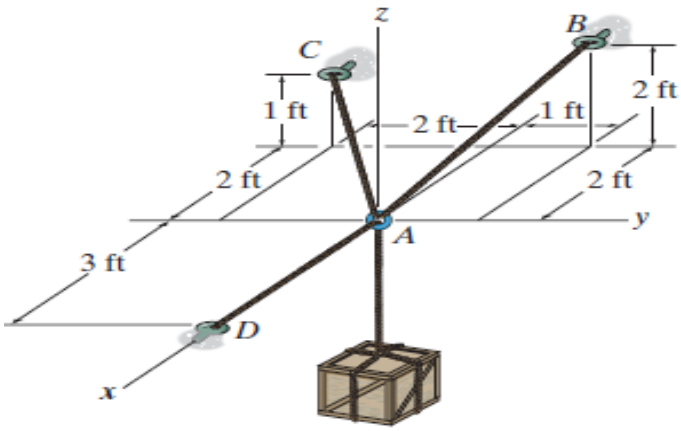
$$F_R = \sqrt{(F_R)_x^2 + (F_R)_y^2} = \sqrt{356.51^2 + 295^2} = 463 \text{ lb}$$





Quistion: 2 ***(8marks)***

Determine the tension developed in cables AB , AC , AD required for equilibrium 300-Ib crate.



$$\mathbf{F}_{AB} = F_{AB}\left[\frac{(-2-0)\mathbf{i}+(1-0)\mathbf{j}+(2-0)\mathbf{k}}{\sqrt{(-2-0)^2+(1-0)^2+(2-0)^2}}\right] = -\frac{2}{3}F_{AB}\mathbf{i}+\frac{1}{3}F_{AB}\mathbf{j}+\frac{2}{3}F_{AB}\mathbf{k}$$

$$\mathbf{F}_{AC} = F_{AC}\left[\frac{(-2-0)\mathbf{i}+(-2-0)\mathbf{j}+(1-0)\mathbf{k}}{\sqrt{(-2-0)^2+(-2-0)^2+(1-0)^2}}\right] = -\frac{2}{3}F_{AC}\mathbf{i}-\frac{2}{3}F_{AC}\mathbf{j}+\frac{1}{3}F_{AC}\mathbf{k}$$

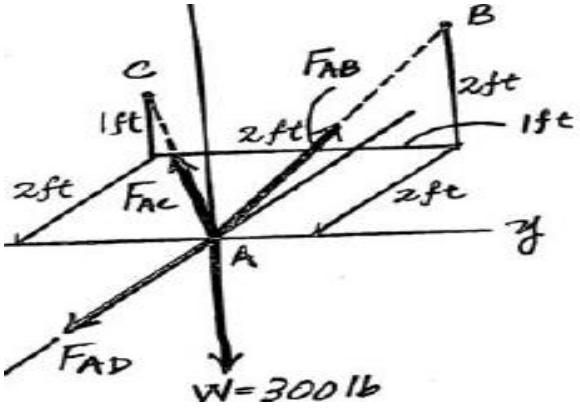
$$\mathbf{F}_{AD} = F_{AD}\mathbf{i}$$

$$\mathbf{W} = [-300\mathbf{k}]\ \text{lb}$$

$$\Sigma\mathbf{F} = \mathbf{0};\quad \mathbf{F}_{AB}+\mathbf{F}_{AC}+\mathbf{F}_{AD}+\mathbf{W} = \mathbf{0}$$

$$\left(-\frac{2}{3}F_{AB}\mathbf{i}+\frac{1}{3}F_{AB}\mathbf{j}+\frac{2}{3}F_{AB}\mathbf{k}\right)+\left(-\frac{2}{3}F_{AC}\mathbf{i}-\frac{2}{3}F_{AC}\mathbf{j}+\frac{1}{3}F_{AC}\mathbf{k}\right)+F_{AD}\mathbf{i}+(-300\mathbf{k}) = \mathbf{0}$$

$$\left(-\frac{2}{3}F_{AB}-\frac{2}{3}F_{AC}+F_{AD}\right)\mathbf{i}+\left(\frac{1}{3}F_{AB}-\frac{2}{3}F_{AC}\right)\mathbf{j}+\left(\frac{2}{3}F_{AB}+\frac{1}{3}F_{AC}-300\right)\mathbf{k} = \mathbf{0}$$



$$-\frac{2}{3}F_{AB}-\frac{2}{3}F_{AC}+F_{AD} = 0$$

$$\frac{1}{3}F_{AB}-\frac{2}{3}F_{AC} = 0$$

$$\frac{2}{3}F_{AB}+\frac{1}{3}F_{AC}-300 = 0$$

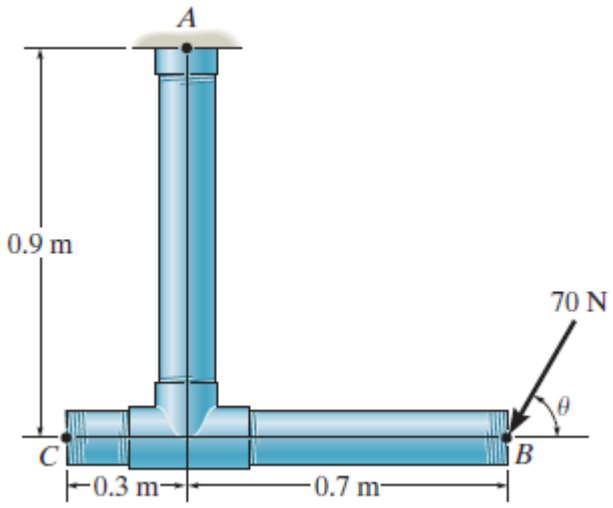
$$F_{AB} = 360\ \text{lb}$$

$$F_{AC} = 180\ \text{lb}$$

$$F_{AD} = 360\ \text{lb}$$

Quistion 3 ***(4 marks)***

Determine the moment produce by the force about point A.



$$(\curvearrowleft + M_A = 70\sin 60°(0.7) + 70\cos 60°(0.9)$$

$$M_A = 73.94 = 73.9\ \text{N·m}\ \circlearrowleft \qquad \textbf{Ans}$$