



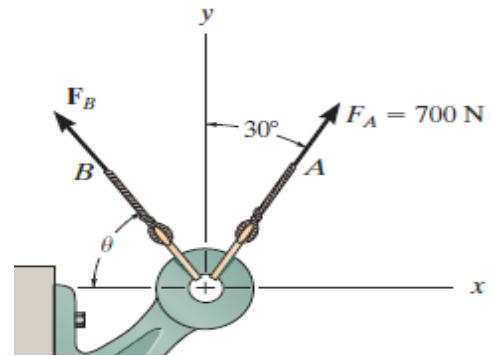
Name: .....

Serial number: ..... Section: .....

**Quistion 1**

(8 marks)

Deyrtmine the magnitude and angle  $\Theta$  of the resultant force acting on the bracket  
 (take  $F_B = 600\text{ N}$ ,  $\Theta = 20^\circ$ )



$$\rightarrow F_{R_x} = \Sigma F_x; \quad F_{R_x} = 700 \sin 30^\circ - 600 \cos 20^\circ$$

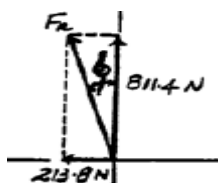
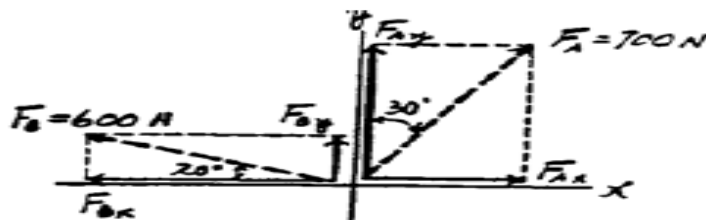
$$= -213.8 \text{ N} = 213.8 \text{ N} \leftarrow$$

$$+ \uparrow F_{R_y} = \Sigma F_y; \quad F_{R_y} = 700 \cos 30^\circ + 600 \sin 20^\circ$$

$$= 811.4 \text{ N} \uparrow$$

$$F_R = \sqrt{F_{R_x}^2 + F_{R_y}^2} = \sqrt{213.8^2 + 811.4^2} = 839 \text{ N}$$

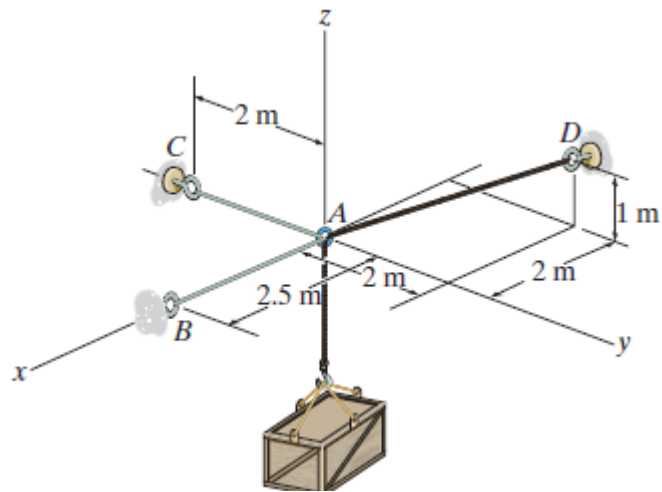
$$\phi = \tan^{-1} \frac{F_{R_x}}{F_{R_y}} = \tan^{-1} \left( \frac{213.8}{811.4} \right) = 14.8^\circ$$



**Question 2**

(8 marks)

Determine the tension in cables to support 100-kg crate in equilibrium position shown.



$$F_{AB} = F_{AB} \mathbf{i}$$

$$F_{AC} = -F_{AC} \mathbf{j}$$

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

$$W = [-100(9.81)\mathbf{k}] \text{ N} = [-981\mathbf{k}] \text{ N}$$

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

$$F_{AB} \mathbf{i} + (-F_{AC} \mathbf{j}) + \left( -\frac{2}{3}F_{AD} \mathbf{i} + \frac{2}{3}F_{AD} \mathbf{j} + \frac{1}{3}F_{AD} \mathbf{k} \right) + (-981\mathbf{k}) = 0$$

$$\left( F_{AB} - \frac{2}{3}F_{AD} \right) \mathbf{i} + \left( -F_{AC} + \frac{2}{3}F_{AD} \right) \mathbf{j} + \left( \frac{1}{3}F_{AD} - 981 \right) \mathbf{k} = 0$$

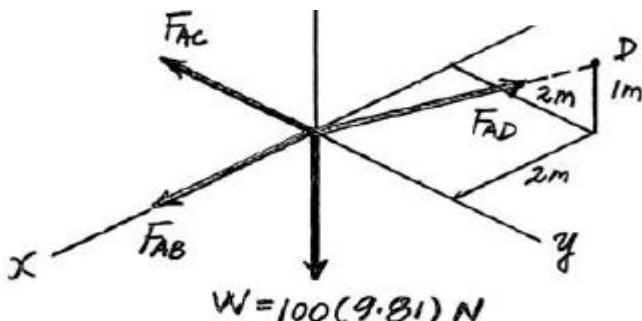
$$F_{AB} - \frac{2}{3}F_{AD} = 0$$

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

$$\frac{1}{3}F_{AD} - 981 = 0$$

$$F_{AD} = 2943 \text{ N} = 2.94 \text{ kN}$$

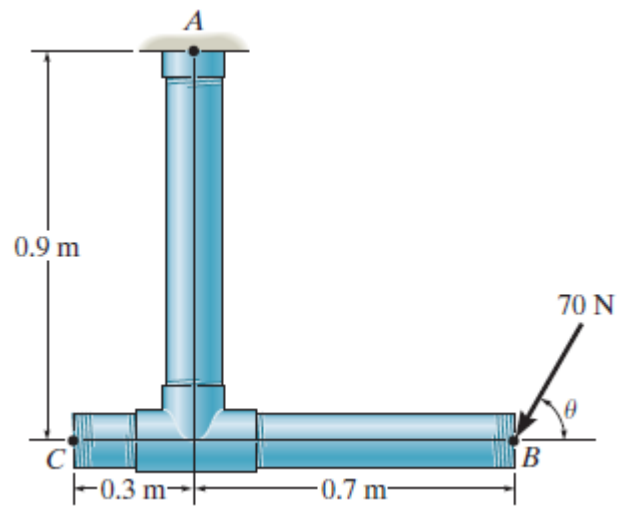
$$F_{AB} = F_{AC} = 1962 \text{ N} = 1.96 \text{ kN}$$



**Question 3**

**(4 marks)**

Determine the moment produce by the force about point A.



$$\sum M_A = 70 \sin 60^\circ (0.7) + 70 \cos 60^\circ (0.9)$$

$$M_A = 73.94 = 73.9 \text{ N}\cdot\text{m} \quad \text{Ans}$$