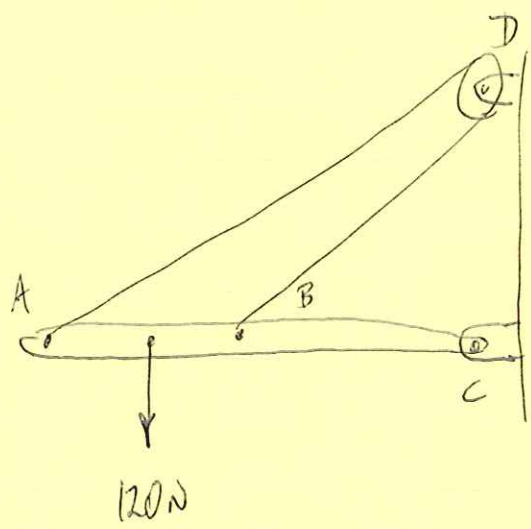
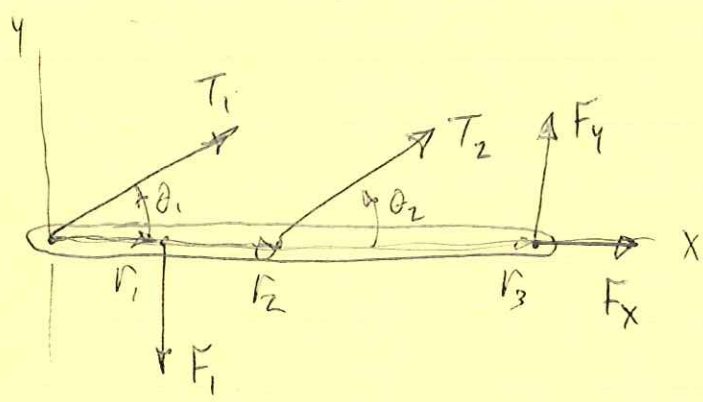


EXAMPLE PROB. 4.30



FIND TENSION IN CABLE,
REACTION AT C

FREE-BODY DIAGRAM:



FIND FORCES:

$$\theta_1 = \text{TAN}^{-1}\left(\frac{150}{360}\right) = 22.6^\circ$$

$$\theta_2 = \text{TAN}^{-1}\left(\frac{150}{200}\right) = 36.9^\circ$$

$$\vec{T}_1 = (T_1 \cos 22.6^\circ) \hat{i} + (T_1 \sin 22.6^\circ) \hat{j} \text{ N}$$

$$\vec{T}_1 = (0.923 T) \hat{i} + (0.384 T) \hat{j} \text{ N}$$

$$\vec{T}_2 = (T \cos 36.9^\circ) \hat{i} + (T \sin 36.9^\circ) \hat{j} \text{ N}$$

$$\vec{T}_2 = (0.8T) \hat{i} + (0.6T) \hat{j} \text{ N}$$

$$\vec{F}_1 = (-120) \hat{j} \text{ N}$$

FIND POSITION VECTORS:

$$\vec{r}_1 = (80) \hat{i} \text{ mm}$$

$$\vec{r}_2 = (160) \hat{i} \text{ mm}$$

$$\vec{r}_3 = (360) \hat{i} \text{ mm}$$

$$\underline{\sum F_x = 0}$$

$$(0.923T) + (0.8T) + F_x = 0$$

$$F_x = -1.72T \quad \text{EQN. (1)}$$

$$\underline{\sum F_y = 0}$$

$$(0.384T) + (0.6T) + (-120) + (F_y) = 0$$

$$F_y = 120 - 0.984T \quad \text{EQN. (2)}$$

$$\underline{\Sigma M_o = 0}$$

$$\vec{r}_1 \times \vec{F}_1 + \vec{r}_2 \times \vec{T}_2 + \vec{r}_3 \times \vec{F}_y = 0$$

$$\vec{M}_1 = \vec{r}_1 \times \vec{F}_1 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 80 & 0 & 0 \\ 0 & -120 & 0 \end{vmatrix}$$

$$\vec{M}_1 = (0)\hat{i} - (0)\hat{j} + [(80)(-120) - 0]\hat{k} \text{ N-mm}$$

$$\vec{M}_1 = (-9600)\hat{k} \text{ N-mm}$$

$$\vec{M}_2 = \vec{r}_2 \times \vec{T}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 160 & 0 & 0 \\ 0.8T & 0.6T & 0 \end{vmatrix}$$

$$\vec{M}_2 = (0)\hat{i} - (0)\hat{j} + [(160)(0.6T) - 0]\hat{k} \text{ N-mm}$$

$$\vec{M}_2 = (96T)\hat{k} \text{ N-mm}$$

$$\vec{M}_3 = \vec{r}_3 \times \vec{F}_y = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 360 & 0 & 0 \\ 0 & F_y & 0 \end{vmatrix}$$

$$\vec{M}_3 = (0)\hat{i} - (0)\hat{j} + [(360)(F_y) - 0]\hat{k} \text{ N-mm}$$

$$\vec{M}_3 = (360 F_y)\hat{k} \text{ N-mm}$$

PROB. 4.30 CONT.

(8)

$$-9600 + 96T + 360 F_y = 0 \quad \text{EQN. (3)}$$

SUBST. EQN. (2) INTO EQN. (3):

$$-9600 + 96T + 360(120 - 0.984T) = 0$$

$$33600 - 258T = 0$$

$$T = 130 \text{ N}$$

EQN. (2):

$$F_y = 120 - 0.984(130) = -7.92 \text{ N} \quad [F_y = (-7.92) \text{ N}]$$

EQN. (1):

$$F_x = -1.72(130) = -224 \text{ N} \quad [F_x = (-224) \text{ N}]$$

$$\vec{F} = (-224)\hat{i} + (-7.92)\hat{j} \text{ N}$$

~~HOMEWORK #4~~

~~4.3, 4.7, 4.15, 4.20~~

~~IN-CLASS #5: PROB. 4.12~~