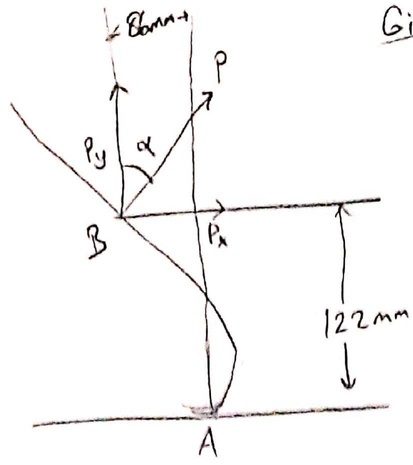
(Q1)



Given

$\alpha = 30°$

$P = 13,2\ N$

Calculate

$P_x = P \sin\alpha$

$P_x = (13,2) \sin 30 = 6,6\ N$

$P_y = P \cos\alpha$

$P_y = (13,2) . \cos 30$

$= 11,43\ N$

$$M_A = P_x (122 mm) + P_y (86 mm)$$

$$= (6,6\ N)(122 mm) + (11,43 N)(86\ mm) = \boxed{1788,18\ N.mm}$$

(Q2)

$$d_{BA} = \sqrt{(-0,9m)^2 + (-8,4m)^2 + (7,2m)^2} = 11,1 m$$

$$d_{BC} = \sqrt{(5.1m)^2 + (-8,4m)^2 + (1.2m)^2} = 9,9 m$$

$$T_{BA} = T_{BA}\left[\frac{\overline{BA}}{d_{BA}}\right] = \left(\frac{777}{11,1}\right)(-0,9\hat{i} - 8,4\hat{j} + 7,2\hat{k})$$

$$T_{BC} = T_{BC}\left[\frac{\overline{BC}}{d_{BC}}\right] = \left(\frac{990}{9,9}\right)(5.1\hat{i} - 8,4\hat{j} + 1,2\hat{k})$$

Resultant $(T_R) = T_{BA} + T_{BC}$

$$T_R = 70[-0,9\hat{i} - 8,4\hat{j} + 7,2\hat{k}] + 100[5,1\hat{i} - 8,4\hat{j} + 1,2\hat{k}]$$

$$= -63\hat{i} - 588\hat{j} + 504\hat{k} + 510\hat{i} - 840\hat{j} + 120\hat{k}$$

$$T_R = 447\hat{i} - 1428\hat{j} + 624\hat{k}$$

Moment about O is

$$M_o = [r_{B/o}] \times [T_R]$$

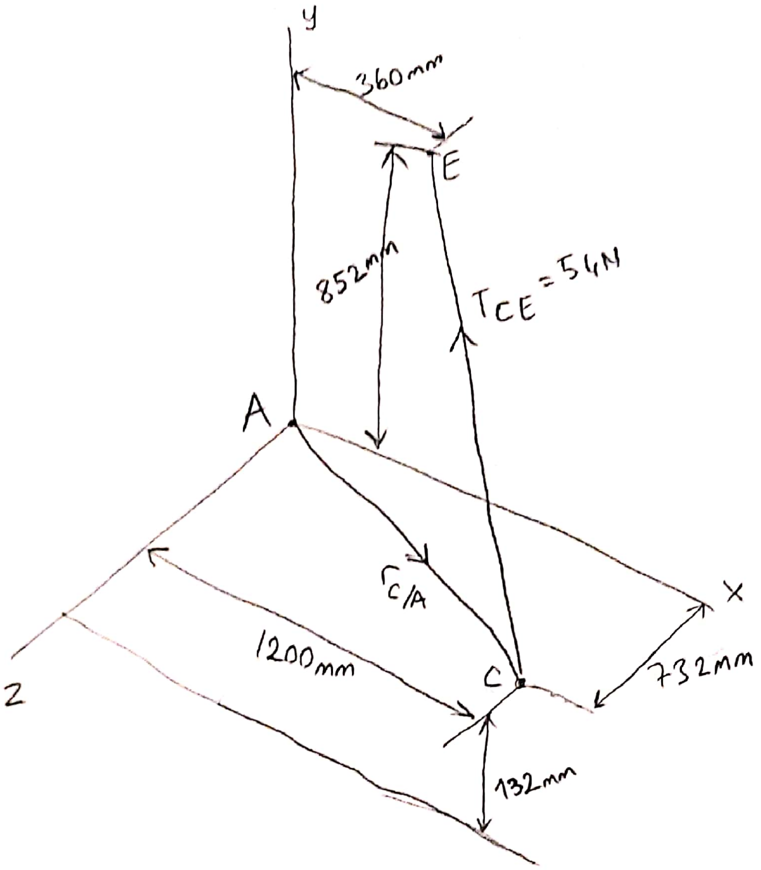
$$M_o = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 8,4 & 0 \\ 447 & -1428 & 624 \end{vmatrix}$$

$$\Rightarrow M_o = \hat{i}[5241,6 - 0] - \hat{j}[0 - 0] + \hat{k}[0 - 3754,8]$$

$$\Rightarrow M_o = 5241,6\hat{i} - 0\hat{j} - 3754,8\hat{k}$$

$$\boxed{M_o = (5241,6\hat{i} - 3754,8\hat{k})\ N\text{-}m}$$

(93) Tension in the cord CE $T_{CE} = 54N$



The moment about A of the force T_{CE} at C is obtained by forming vector product, $M_A = r_{C/A} \times T_{CE}$

Resolve $r_{C/A}$ into rectangular components,

$$r_{C/A} = (1200mm)i + (132mm)j + (732mm)k$$

Determine the components and magnitude of vector $\vec{CE}$ denoting by i, j, k the unit vectors along the coordinate axes,

$$\vec{CE} = (-840mm)i + (720mm)j + (-732mm)k$$

The magnitude of $\vec{CE}$

$$CE = \sqrt{(-840mm)^2 + (720mm)^2 + (-732mm)^2}$$
$$= 1326,6 \; mm \cong 1,3m$$

Define $\lambda_{CE} = \frac{\vec{CE}}{CE}$, as the unit vector along CE. Then, we can write, $T_{CE} = T_{CE}\frac{\vec{CE}}{CE}$

Substitute the values of T_{CE}, $\vec{CE}$ and CE

$$T_{CE} = \frac{54N}{1,3m}[(-0,84m)i + (0,72m)j + (-0,732m)k]$$
$$= (-34,9N)i + (29,9N)j + (-30,4N)k$$

Now taking the vector product $M_A = r_{A/C} \times T_{CE}$.

$$M_A = [(1,2m)i + (0,132m)j + (0,732m)k] \times [(-34,9N)i + (29,9N)j + (-30,4N)k)]$$
$$= (-25,9Nm)i + (10,9 Nm)j + (40,48 Nm)k$$

$\boxed{M_x = -25,9 \; N.m}$

$\boxed{M_y = 10,9 \; N.m}$

$\boxed{M_z = 40,48 \; N.m}$

(Q4)

$T = 36\ N \qquad M = F \times d$

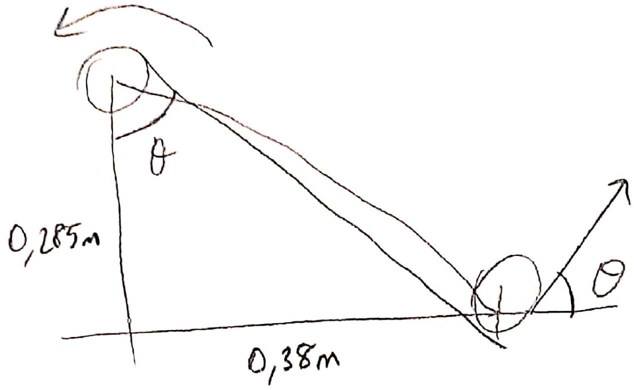
$M_1 = F \times d$

$= 36 \times (285 + 60\,mm)$

$= 36 \times (0{,}345\,m) = 12{,}42\ N.m\ (+)$

$M_2 = 10 \times (0{,}38\,m) = 3{,}8\ N.m\ (-)$

$\Sigma M = M_1 + M_2 = 12{,}42 - 3{,}8 = \boxed{8{,}62\ N.m}$



$\theta = \tan^{-1}(0{,}38 / 0{,}285) = 52{,}43°$

$R = \sqrt{(0{,}38)^2 + (0{,}285)^2} = 0{,}475\ m$

Distance AC $= 0{,}475 + 0{,}06\,m$

$= 0{,}535\,m$

$T * 0{,}535\,m = 8{,}62\ N.m$

c.) $\boxed{T_{min} = 16{,}11\ N}$