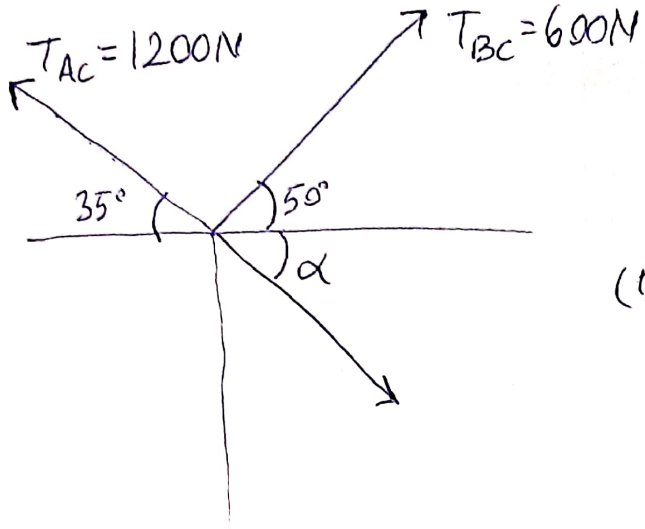
(Q1) Tension at each cable

$T_{AC} = 1200N$

$T_{BC} = 600N$



$\sum F_x = 0$

$P\cos\alpha + T_{BC}\cos 50° - T_{AC}\cos 35° = 0$

$P\cos\alpha + (600)(2\cos 35° - \cos 50°) = 0$

(1) $P\cos\alpha = 597,31$

$\sum F_y = 0$

$P\sin\alpha - T_{BC}\sin 50° - T_{AC}\sin 35° = 0$

$P\sin\alpha - 600(\sin 50 + 2\sin 35) = 0$

(2) $P\sin\alpha = 1147,91$

By squaring and adding of equations (1) and (2)

$(P\cos\alpha)^2 + (P\sin\alpha)^2 = (597,31)^2 + (1147,91)^2$

$P^2 = 1674476,60$

a.) $P = 1294,01N$

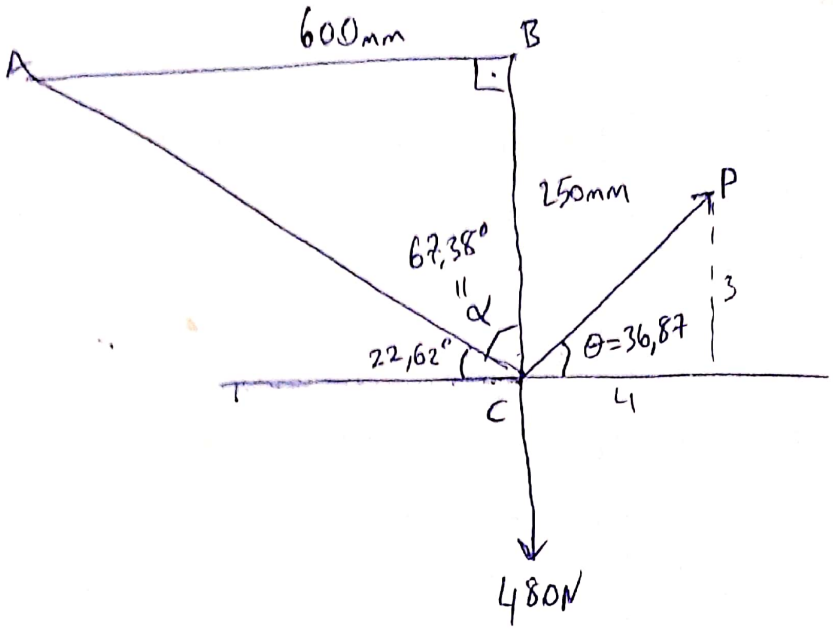
b.) For finding angle α, substitute P in the equation (1)

$1294,01\cos\alpha = 597,31$

$\cos\alpha = \frac{597,31}{1294,01}$

$\alpha = 62,5°$

Q2



$\theta = \tan^{-1}\left(\frac{3}{4}\right)$

$\theta = 36,87°$

$\alpha = \tan^{-1}\left(\frac{600}{250}\right)$

$\alpha = 67,38°$

$\Sigma F_x = 0$

$P.\cos 36,87° - T_{AC}.\cos 22,62° = 0$

$T_{AC} = \frac{P.\cos 36,87°}{\cos 22,62°}$ ①

$T_{AC} = P.0,86$

From ②

$\frac{480 - P\sin 36,87 - T_{BC}}{\sin 22,62} = P.0,86$

$480 - T_{BC} = P.0,32 + P.060$

$\frac{521,74 - T_{BC}}{0,92} = P$

$\Sigma F_y = 0$

$P.\sin 36,87° + T_{AC}.\sin 22,62° + T_{BC} = 480$

② $T_{AC}.\sin 22,62° = 480 - P\sin 36,87° - T_{BC}$

From ①

$\frac{P.\cos 36,87°}{\cos 22,62°}.\sin 22,62° = 480 - P\sin 36,87° - T_{BC}$

$P + P\sin 36,87 = \frac{(480 - T_{BC})\cos 22,62}{\cos 36,87.\sin 22,62}$

$P(1 + \sin 36,87) = (480 - T_{BC}).0,44$

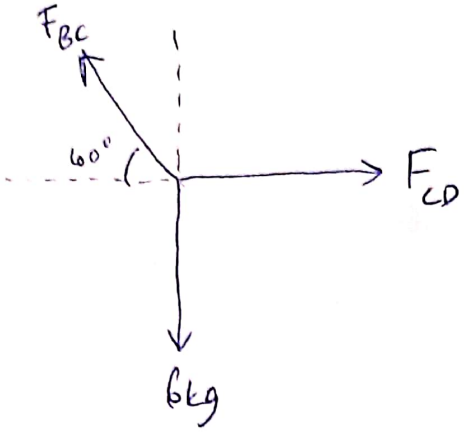
$P = \frac{(480 - T_{BC}).0,44}{1,6}$

$= 132 - \frac{0,44\,T_{BC}}{1,6}$

P shald be ler than 132lb

$P < 132$

(Q3) For body diagram of point C.



$$\Sigma F_y = 0$$

$$F_{BC}\sin 60^\circ = 6kg$$

$$F_{BC}\cdot\frac{\sqrt{3}}{2} = 6\times 9{,}81$$

$$F_{BC} = 67{,}96 \simeq 68N$$

$$\Sigma F_x = 0$$

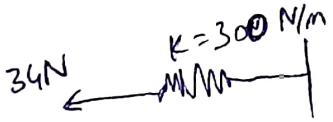
$$F_{BC}\cos 60^\circ = F_{CD}$$

$$F_{CD} = 68\cos 60$$

$$= \boxed{34N}$$

a.) Force in spring CD = 34 N

b.)



$$34 = 300N/M\ x$$

change in length $\boxed{x = 0{,}113\ m}$