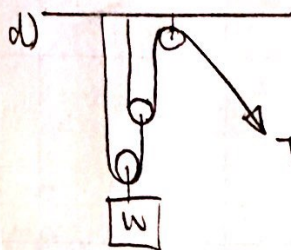
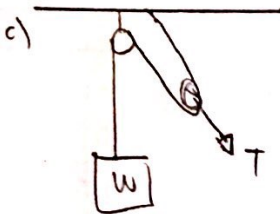
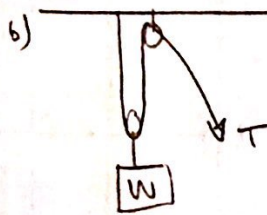
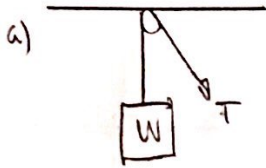


1.

Solution:

a) FBD:



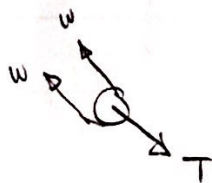
$$\rightarrow |\vec{T}| = W$$

b) FBD



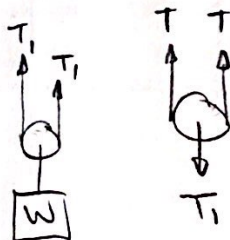
$$\rightarrow |2\vec{T}| = W \rightarrow |\vec{T}| = \frac{W}{2}$$

c)



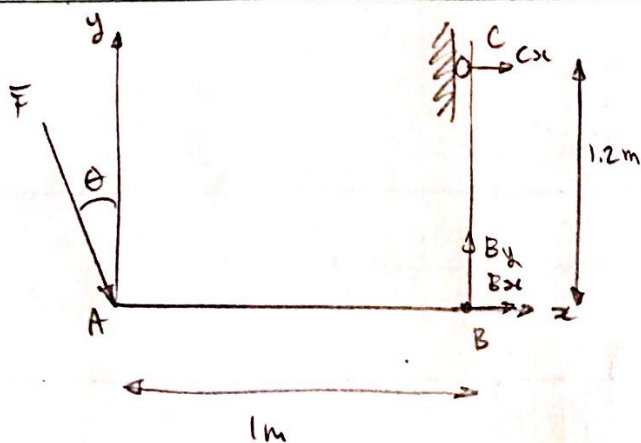
$$\rightarrow |\vec{T}| = 2W$$

d)



$$\begin{aligned} T_1 &= 2T \\ W &= 2T_1 \\ \rightarrow W &= 2(2T) = 4T \\ \rightarrow T &= \frac{W}{4} \end{aligned}$$

2.



$$\bar{F} = 100\text{N}$$

$$\theta = 20^\circ$$

$$\sum F_x: F \sin \theta + B_x + C_x = 0 \quad (1)$$

$$\sum F_y: -F \cos \theta + B_y = 0 \quad (2)$$

$$\sum M_A: +B_y(1\text{m}) - C_x(1.2\text{m}) = 0 \quad (3)$$

from (2):  $B_y = F \cos \theta$   
 $B_y = 93.97\text{N}$

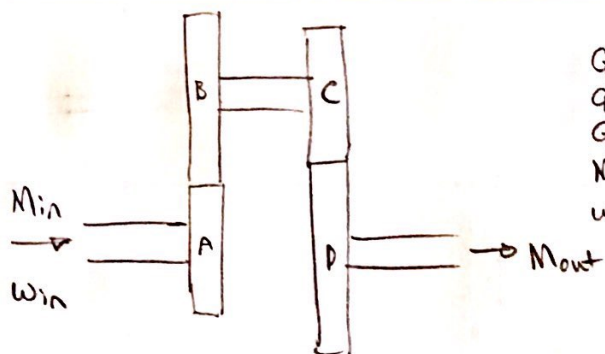
into (3):  $\frac{93.97(1)}{1.2} = C_x$   
 $C_x = 78.31\text{N}$

into (1):  $100 \sin 20 + B_x + 78.31 = 0$   
 $B_x = -112.51\text{N}$

$$\rightarrow \begin{aligned} R_B &= -112.51 \hat{i} + 93.97 \hat{j} \text{ N} \\ R_C &= +78.31 \hat{i} \text{ N} \end{aligned}$$

3.

a)



$$\begin{aligned} G_A &= 10 \\ G_B &= 20 \\ G_C &= 16 \\ M_{in} &= 120 \text{ N}\cdot\text{m} \\ \omega_{in} &= 1750 \text{ rpm} \end{aligned}$$

b)  $M_{out} = 600 \text{ N}\cdot\text{m}$

$$M_{in} \cdot G_B = M_{out}$$

$$\rightarrow G_B = \frac{M_{out}}{M_{in}}$$

$$G_B = \frac{600}{120}$$

$$G_B = 5 \text{ or } 5:1$$

c)  $G_B = \frac{G_A}{G_C} \cdot \frac{G_D}{G_C}$

$$\rightarrow G_D = \frac{G_B \cdot G_A \cdot G_C}{G_C}$$

$$G_D = 40 \text{ teeth}$$

d)  $\frac{M_{in}}{M_{out}} = \frac{\omega_{out}}{\omega_{in}}$

$$\rightarrow \omega_{out} = \frac{M_{in}}{M_{out}} \cdot \omega_{in}$$

$$\omega_{out} = \frac{120}{600} \cdot 1750$$

$$\omega_{out} = 350 \text{ rpm}$$