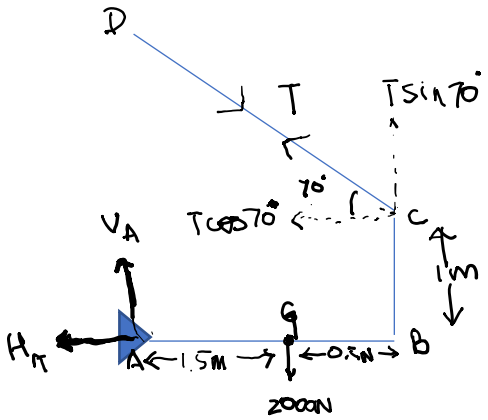
Convention used in this assignment :

- Force towards the right = +ve
- Force towards the left = -ve
- Upward force = +ve
- Downward force = -ve
- Counter-Clockwise moment = +ve
- Clockwise moment = -ve

1.

(a)



(b) Vertical component of tension(T) acting at C = Tsin70° = 0.939T

The horizontal component of tension(T) acting at C = -Tcos70° = -0.342T

(c) $\Sigma F_x = 0$ equation: $H_A - T\cos70° = 0$ → Eq.1

$\Sigma F_y = 0$ equation: $V_A + T\sin70 - 2000 = 0$ → Eq.2

(d) $M_A = T\cos70 \times 1 + T\sin70 \times 2 - 2000 \times 1.5 = 0$ → Eq.3

(e) From Eq.1, we get

$T(\cos70 + 2\sin70) = 3000$

$T = 3000/(0.342 + 2 \times 0.9397) = 1350.4997N$

(f) From Eq.1, $H_A = -T_A\cos70 = -1350.4997 \times 0.342$

$H_A = -461.87N$ (Towards the right)

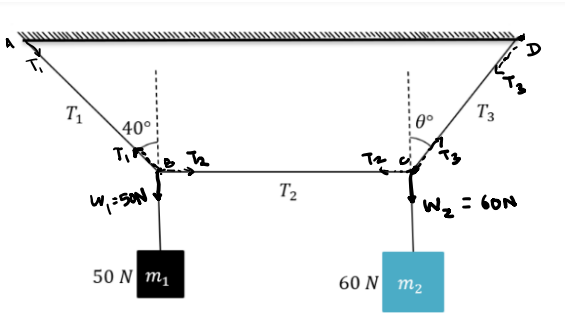
From Eq.2, $V_A = 2000 - T_A\sin70 = 2000 - (1350.4997 \times 0.9797)$

$= 2000 - 1269.0646$

$V_A = 730.9354N$ (Upwards)

2.

(a)



(a) At B:

Component of T_1 in vertical direction (upwards) = $T_1\cos40°$

$= 0.766T_1$

Component T_1 in horizontal direction (towards left) = $T_1\sin40°$

$= 0.6428T_1$

(b) On m_1:

Weight acting downward = w_1 = -50N

Tension acting upward = $0.766T_1$ (From (b))

∴ By vertical force equilibrium at B: $0.766T_1 - 50 = 0$ → Eq. 1

The horizontal force equilibrium equation: $T_2 - 0.6428T_1 = 0$ → Eq. 2

(c) From Eq. 1: $0.766T_1 = 50$

$T_1 = 65.274N$

From Eq. 2: $T_2 = 0.6428T_1$

$T_2 = 41.9582N$

(d) Component of T_3 in vertical direction = $T_3\cos\theta$

Component of T_3 in horizontal direction = $T_3\sin\theta$

(e) On m_2:

Vertical force equilibrium equation at C: $T_3\cos\theta - 60 = 0$ → Eq. 3

Horizontal force equilibrium equation at C: $T_3\sin\theta - T_2 = 0$ → Eq. 4

(f) From Equations 3 and 4,

$T_3\cos\theta = 60$

$T_3\sin\theta = T_2$

Dividing these 2 equations, we get

$\cot\theta = 60/T_2$

$= 1.43$

$\theta = \cot^{-1}(1.43) = 34.965°$

(g) $T_3 = 60/\cos\theta$

$= 60/0.8195$

$= 73.2152N$