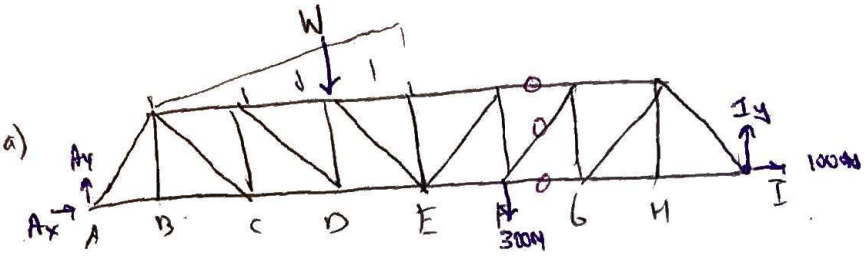
30/30

NAME Jeffrey Tsang

Problem 1

a)



$W = \frac{1}{2}(W_{max})(3m)$

$= \frac{1}{2}[200](3) = 300\,N$

$\Sigma M_A = -W \cdot 3m - 300 \cdot 5m + I_y(8m)$

$-900 - 1500 = -I_y(8)$

$\boxed{I_y = 300\,N\uparrow}$

$\Sigma M_I = 3m \cdot 300N + W(5m) - A_y = 0$

$900 + 1500 = A_y(8)$

$\boxed{A_y = 300N\uparrow}$

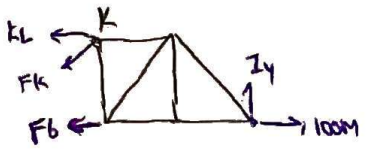
$\Sigma F_y = A_y + I_y$
$300 + 300 - 300 - 300$
$= 0$ ✓

$\Sigma F_x = A_x + 100N = 0$

$A_x = -100$

$\boxed{A_x = 100\,N \leftarrow}$

b) redraw



$I_y = 300\ N$

$\Sigma M_K = 0$

$\curvearrowright -F_b \cdot 1m + I_y \cdot 2m + 100N \cdot 1m = 0$

$-F_b = 600 + 100$

$F_b = 700N$ Tension

$\Sigma F_y = 0 \uparrow I_y - F_K \sin(45) = 0$

$300 = F_K \frac{\sqrt{2}}{2}$

$\frac{300 \cdot 2\sqrt{2}}{\sqrt{2}} = F_K$

$F_K = 300\sqrt{2}N$ Tension

$\Sigma F_x = 0$

$\rightarrow 100 - F_b - F_{K_x} - K_L = 0$

$100 - 700 - 300 - K_L = 0$

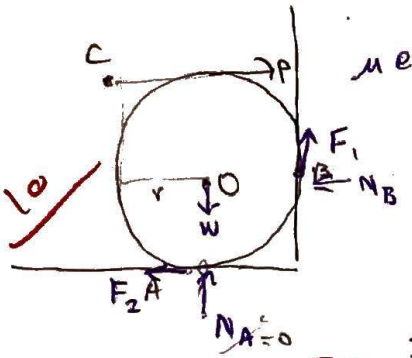
$-900 = K_L$

$K_L = 900\ N$ Compression

NAME Jeffrey Tsang

Problem 2

35



10

μ @ A, B

Condition Roll UP when $N_A = 0$ (5)

thus $F_2 = 0$ (5)

a) (5)

$\Sigma F_x = P - N_B = 0 \quad P = N_B$ (5)

$\Sigma F_y = F_1 - W = 0 \rightarrow F_1 = W \leq \mu N_B$ (10)

$\Sigma M_A = -P(2r) + F_1(r) + N_B(r) = 0$

$-2P + F_1 + N_B = 0$

$\mu N_B + N_B = 2P$

$(\mu + 1) N_B = 2P$

$\mu + 1 = \frac{2P}{N_B}$

$\mu + 1 = 2\frac{P}{P}$

$\mu = 1$

$\boxed{\mu \geq 1}$ ✓

b) impending rolling:

$P = N_B \qquad W = \mu N_B$

$\frac{W}{\mu} = N_B$

$P = \frac{W}{\mu}, \quad \mu = 1$ ✓

$\boxed{P = W}$

C

Normal force A = 0

thus Frictional Force A = 0

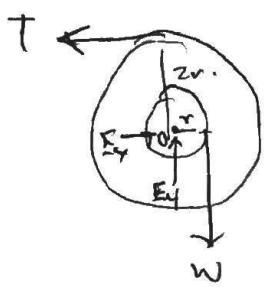
Frictional Fore B = W ↑

Normal Force B = W ←

NAME Jeffrey Tsang

Problem 3

a)

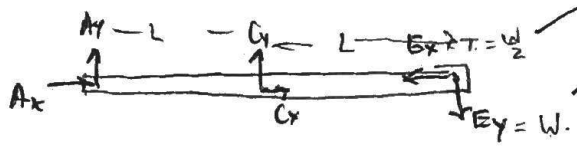


$\Sigma M_O = -W \cdot r + T(2r) = 0$

$T = \frac{W}{2}$

$\Sigma F_x: \quad T = E_x$

$\Sigma F_y \quad W = E_y.$



$\Sigma F_x = C_x + A_x - E_x = 0$

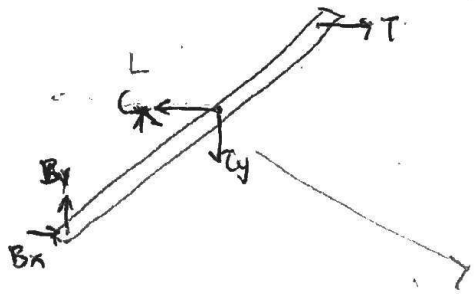
$\Sigma F_y = -A_y + C_y - E_y = 0.$

$\Sigma M_{C_1} = -E_y \cdot L - A_y \cdot L = 0$

$A_y = -E_y$

$\boxed{A_y = -W.}$

$\boxed{A_y = W \downarrow}$



$\Sigma M_B = -C_y \cdot L + C_x \cdot L - (L+2r)T$

$\Sigma F_y = -W + C_y - W = 0$

$\boxed{C_y = 2W}$

$-2W \cdot L + C_x \cdot L - (L+2r)T = 0$

$C_x L = T(L+2r) + 2W \cdot L$

$\boxed{C_x = \frac{W}{2L}(L+2r) + 2W}$

NAME Jeffrey Tsang

Problem 3

$$\Sigma F_x = C_x + A_x - E_x = 0$$

$$\frac{W}{2L}(L+2r) + 2W + A_x - \frac{W}{2} = 0$$

$$A_x = -\frac{3W}{2} - \frac{W}{2L}(L+2r) \rightarrow$$

Member $\overline{BD}$

$$\Sigma F_y = B_y - C_y = 0$$

$$B_y = C_y = 0$$

$$B_y = 2W$$

$$\Sigma F_x$$

$$B_x - C_x + T = 0$$

$$B_x = C_x - T$$

$$= \frac{W}{2L}(L+2r) + 2W - \frac{W}{2}$$

$$B_x = \frac{W}{2L}(L+2r) - \frac{3W}{2}$$