4

$\sum \vec{M}_A = 0 \Rightarrow F_t \cdot 2R = P \cdot R \operatorname{sen} 30° \Rightarrow 2F_t = P \operatorname{sen} 30° = 10 \cdot 9.81 \cdot \frac{1}{2} = 49.05$ Nw

$\boxed{F_t = 24.525 \text{ Nw}}$

$\sum F_x = 0 \Rightarrow F_t - P \operatorname{sen} 30° - T \operatorname{sen} 30° = 0 \Rightarrow 24.525 - 10 \cdot 9.81 \cdot \frac{1}{2} + \frac{T}{2} = 0$

$\boxed{T = 49.05 \text{ Nw}}$

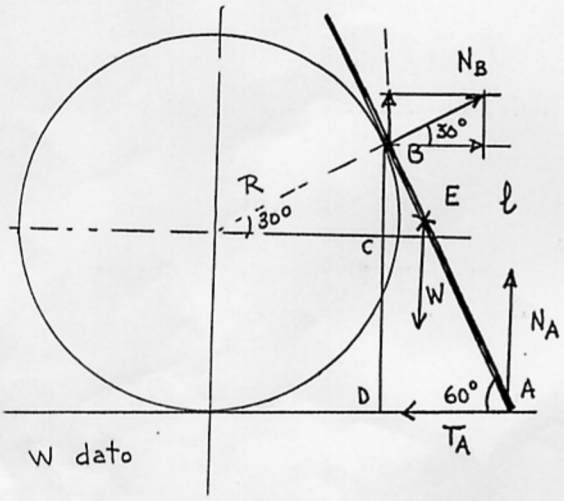
$\sum F_y = 0 \Rightarrow N - P \cos 30° + T \cos 30° = 0 \Rightarrow N - 10 \cdot 9.81 \frac{\sqrt{3}}{2} + 49.05 \frac{\sqrt{3}}{2} = 0$

$\boxed{N = 42.479 \text{ Nw}}$

$\mu \geq \frac{24.525}{42.479} = 0.58$ $\quad \boxed{\mu_m = 0.58}$

2

4)



$BC = R \operatorname{sen} 30$, $CD = R$ $\Big\}$ $BD = R(1 + \operatorname{sen} 30)$

$(AB) = \frac{BD}{\operatorname{sen} 60} = \frac{R(1 + 1/2)}{\sqrt{3}/2} = \frac{R\,3/2}{\sqrt{3}/2} = R\sqrt{3}$

$\left.\begin{aligned} \sum F_x = 0 &\Rightarrow N_B \cos 30 = T_A \\ \sum F_y = 0 &\Rightarrow N_B \operatorname{sen} 30 + N_A = W \\ \sum M_A = 0 &\Rightarrow W \tfrac{\ell}{2} \operatorname{sen} 30 = N_B \cdot AB \end{aligned}\right\}$

$\left.\begin{aligned} N_B \frac{\sqrt{3}}{2} &= T_A \\ N_B \frac{1}{2} + N_A &= W \\ W \frac{5R}{4} \cdot \frac{1}{2} &= N_B R\sqrt{3} \end{aligned}\right\}$

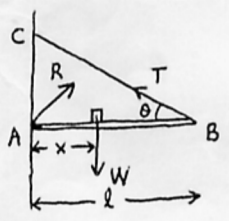
$N_B = \frac{5W}{8\sqrt{3}} \Rightarrow \boxed{N_B = \frac{5\sqrt{3}}{24} W}$

$T_A = N_B \cos 30 = \frac{5\sqrt{3}}{24} W \frac{\sqrt{3}}{2} = \frac{5}{16} W$ $\quad \boxed{T_A = \frac{5}{16} W}$

$N_A = W - N_B \operatorname{sen} 30 = W - \frac{5\sqrt{3}}{24} W \cdot \frac{1}{2}$ $\quad \boxed{N_A = \left(\frac{48 - 5\sqrt{3}}{48}\right) W}$

$\mu_{min} = \frac{T_A}{N_A} = \frac{15}{48 - 5\sqrt{3}}$ $\quad \boxed{\mu_{min} = \frac{15}{48 - 5\sqrt{3}}}$

2)



a) $\sum \vec{M}_A = 0 \Rightarrow W \cdot x - T \ell \operatorname{sen}\theta = 0$; $\boxed{T = \frac{mgx}{\ell \operatorname{sen}\theta}}$

b) $\sum \vec{F} = 0$ $\quad \boxed{R_h = T \cos\theta = \frac{mgx \cos\theta}{\ell \operatorname{sen}\theta} = \frac{mgx}{\ell \operatorname{tg}\theta}}$

$R_v + T \operatorname{sen}\theta = W$; $\boxed{R_v = mg - T \operatorname{sen}\theta = mg - \frac{mgx}{\ell} = mg\left(1 - \frac{x}{\ell}\right)}$