

Assignment 11

9.5

$$r_1 = 0.19 \text{ m}$$

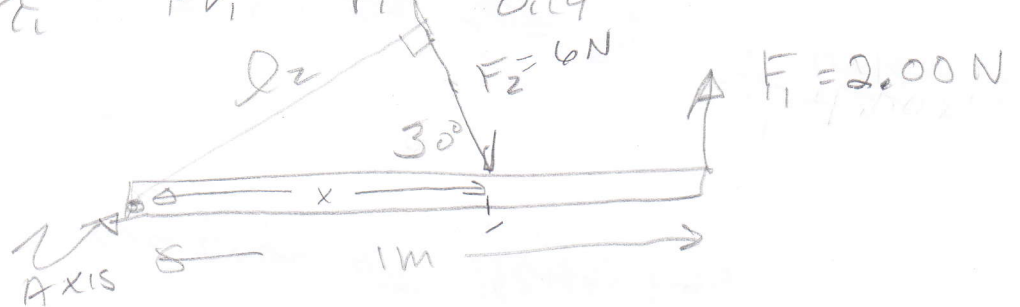
$$r_2 = 0.25 \text{ m}$$

$$\tau_1 = F r_1$$

$$\tau_2 = F r_2$$

$$\frac{\tau_2}{\tau_1} = \frac{F r_2}{F r_1} = \frac{r_2}{r_1} = \frac{0.25}{0.19} = 1.32$$

9.9



$$\sum \tau = 0 = \tau_1 + \tau_2$$

$$\tau_1 = 2 \times 1 = 2 \text{ N}\cdot\text{m}$$

$$\tau_2 = -l_2 F_2 = -l_2 6$$

$$\sin(30^\circ) = \frac{l_2}{x}$$

$$\sin 30^\circ = \frac{1}{2}$$

$$x = \frac{l_2}{\sin(30)} = 2l_2$$

$$\sum \tau = 0 = 2 - 6l_2 = 0$$

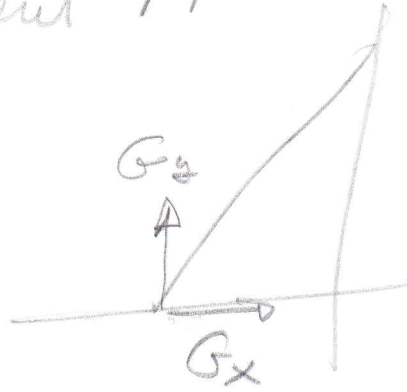
$$l_2 = \frac{2}{6} = \frac{1}{3}$$

$$x = 2l_2 = \frac{2}{3} = \underline{\underline{0.667 \text{ m}}}$$

Assignment 11

9.13

From Example 4



$$G_y = 1230 \text{ N}$$

$$G_x = 727 \text{ N}$$

$$G_y = F_N = \text{NORMAL FORCE}$$

$$G_x = F_f = \text{FRICTION FORCE}$$

$$F_f = \mu_s F_N$$

$$\mu_s = \frac{F_f}{F_N} = \frac{G_x}{G_y} = \frac{727}{1230} =$$

$$\mu_s = 0.591$$

Assignment 1.1

a) Tangential Speed

$$v_T = r\omega$$

9.43

$$m_1 = 6 \text{ kg}$$

$$r_1 = 2.0 \text{ m}$$

$$m_2 = 4 \text{ kg}$$

$$r_2 = 1.5 \text{ m}$$

$$m_3 = 3 \text{ kg}$$

$$r_3 = 3.0 \text{ m}$$

$$\omega = 6.00 \text{ rad/s}$$

$$v_1 = r_1 \omega = 2 \times 6 = 12 \text{ m/s}$$

$$v_2 = r_2 \omega = 1.5 \times 6 = 9 \text{ m/s}$$

$$v_3 = r_3 \omega = 3 \times 6 = 18 \text{ m/s}$$

b) $KE = \sum \frac{1}{2} m_i v_i^2$

$$KE = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 + \frac{1}{2} m_3 v_3^2$$

$$KE = \frac{1}{2} \times 6 \times (12)^2 + \frac{1}{2} \times 4 \times 9^2 + \frac{1}{2} \times 3 \times 18^2$$
$$= 432 + 162 + 486$$

b) $KE = 1080 \text{ J}$

c) $I = r_1^2 m_1 + r_2^2 m_2 + r_3^2 m_3$

$$= 4 \times 6 + (1.5)^2 \times 4 + 9 \times 3 =$$
$$24 + 9 + 27 = 60$$

$$I = 60 \text{ kg} \cdot \text{m}^2$$

d) $KE = \frac{1}{2} I \omega^2 = \frac{1}{2} \times 60 \times 6^2 = 1080 \text{ J}$

Assignment 11

$$9.45 \quad E = \frac{1}{2} I \omega^2 = 1.2 \times 10^9 \text{ J}$$

$$I = \frac{1}{2} M R^2 = \frac{1}{2} \times 13 \times (0.3)^2$$

$$\omega^2 = \frac{2 \times 1.2 \times 10^9}{I} = \frac{2 \times 1.2 \times 10^9}{\frac{1}{2} \times 13 \times (0.3)^2}$$

$$\omega^2 = 4.1025641 \times 10^9$$

$$\omega = \sqrt{4.1026 \times 10^9} = 6.405 \times 10^4 \text{ rad/s}$$

$$\omega = 6.405 \times 10^4 \frac{\text{rad}}{\text{s}} \times \left(\frac{1 \text{ rev}}{2\pi \text{ rad}} \right) \times \frac{60 \text{ s}}{\text{min}}$$

$$= 6.116 \times 10^4 \text{ rev/min}$$

$$\omega = 6.116 \times 10^5 \text{ rpm}$$

$$\boxed{\omega = 6.1 \times 10^5 \text{ rpm}}$$