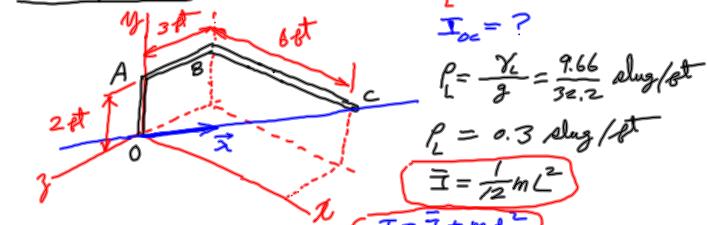


Example 19.7



$$\gamma_L = 9.66 \text{ lb/ft}$$

$$I_{oc} = ?$$

$$P_L = \frac{\gamma_L}{g} = \frac{9.66}{32.2} \text{ slug/ft}$$

$$P_L = 0.3 \text{ slug/ft}$$

$$I = \frac{1}{12} m L^2$$

$$I = \bar{I} + m d^2$$

$$I_{xy} = \bar{I}_{xy} + m \bar{x} \bar{y}$$

$$I_{yy} = \bar{I}_{yy} + m \bar{y}^2$$

$$I_{xx} = \bar{I}_{xx} + m \bar{x}^2$$

$$I_{xy} = I_{xx} \lambda_x^2 + I_{yy} \lambda_y^2 + I_{zz} \lambda_z^2 - 2 I_{xy} \lambda_x \lambda_y - 2 I_{yz} \lambda_y \lambda_z - 2 I_{zx} \lambda_z \lambda_x$$

$$\vec{OC} = \vec{OA} + \vec{AB} + \vec{BC} = 2\hat{i} - 3\hat{k} + (\hat{i} = \langle 6, 2, -3 \rangle), \quad \vec{OC} = 7$$

$$\lambda = \frac{1}{7} \langle 6, 2, -3 \rangle \quad \lambda_x = \frac{6}{7}, \quad \lambda_y = \frac{2}{7}, \quad \lambda_z = -\frac{3}{7}$$

$$m_{OA} = 0.6 \quad m_{AB} = 0.9 \quad m_{BC} = 1.8$$

$$I_{xy} = \left[\frac{1}{12} (0.6) (2)^2 + 0.6 (1)^2 \right] + \left\{ \frac{1}{12} (0.9) (3)^2 + 0.9 [(2)^2 + (1.5)^2] \right\} + \left\{ 0 + 1.8 [(2)^2 + (3)^2] \right\} = 30.5 \quad I_{xy} = 30.5 \text{ slug ft}^2$$

$$I_{yy} = (0+0) + \left[\frac{1}{12} (0.9) (3)^2 + 0.9 (1.5)^2 \right] + \left\{ \frac{1}{12} (1.8) (6)^2 + 1.8 [(3)^2 + (3)^2] \right\} = 40.5$$

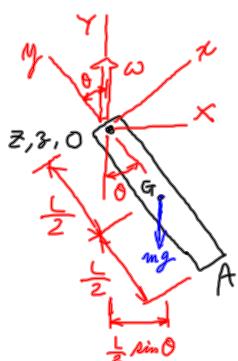
$$I_{yy} = 40.5 \text{ slug ft}^2$$

$$I_{xy} = (0+0) + (0+0) + [0 + 1.8(3)(2)] = 10.8$$

$$I_{xy} = 10.8 \text{ slug ft}^2$$

etc.

Example 19.11 (P.882) V.V... G.P.



$$L = 0.5 \text{ m} \quad m = 2 \text{ kg}$$

$$\theta = 30^\circ \quad \dot{\omega} = \ddot{\omega} \quad \omega = ?$$

Euler's eq. of motion:

$$\sum M_3 = I_3 \ddot{\omega}_3 - (I_x - I_y) \omega_x \omega_y$$

$$\omega_x = \omega \sin \theta \quad \omega_y = \omega \cos \theta \quad \omega_z = 0$$

$$\dot{\omega}_x = \dot{\omega}_y = \dot{\omega}_z = 0$$

$$I_x = I_3 = \frac{1}{12} m L^2 + m \left(\frac{L}{2}\right)^2 = \frac{1}{3} m L^2$$

$$I_y = 0 \quad I_{xy} = I_{yz} = I_{zx} = 0$$

$$-\left(\frac{L}{2} \sin \theta\right)(\dot{\omega}_y) = 0 - \left(\frac{1}{3} m L^2 - 0\right) (\omega \sin \theta) (\omega \cos \theta)$$

$$-\frac{L}{2} + \frac{\omega^2}{3} \cos \theta = 0 \quad \frac{1}{6} (-3g + 2\omega^2 L \cos \theta) = 0$$

$$\omega^2 = \frac{3g}{2L \cos \theta} = \frac{3(9.81)}{2(0.5) \cos 30^\circ}$$

$$\omega = 5.829 \quad \boxed{\omega = 5.83 \text{ rad/s}}$$

Reminder.

- Instructor will visit the UAFS class during 3:30 - 5:00 p.m., Thursday, 12/10/09, Room 247, Baldor.
- Study well the following examples: 19.1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13.
- HW to be collected on the day of the F.E. (during 12:30 - 2:30 p.m.) on Friday, 12/11/09, will be from among the following problems: 19.29, 35, 37, 41, 43, 44, 48, 49, 51.