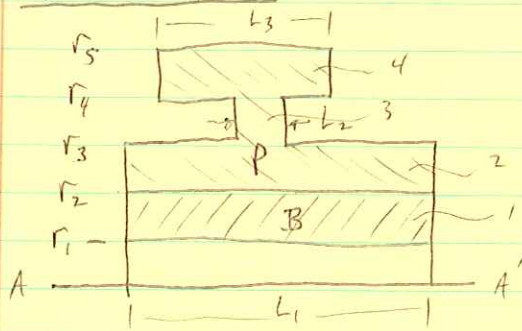


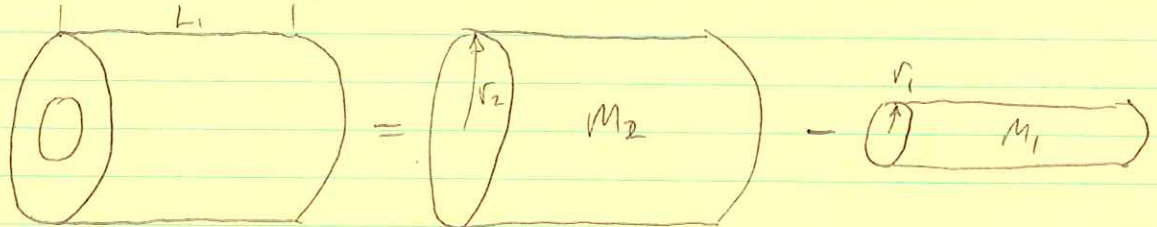
PROB. 9.127



$$\rho_B = 8650 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_P = 1250 \frac{\text{kg}}{\text{m}^3}$$

$$I_{AA'} = I_1 + I_2 + I_3 + I_4$$



$$\begin{aligned} I_1 &= \frac{1}{2} M_2 r_2^2 - \frac{1}{2} M_1 r_1^2 \\ &= \frac{1}{2} (\rho_B V_2 r_2^2 - \rho_B V_1 r_1^2) \\ &= \frac{1}{2} \rho_B (\pi r_2^2 L \cdot r_2^2 - \pi r_1^2 L \cdot r_1^2) \end{aligned}$$

$$I_1 = \frac{\pi}{2} \rho_B L_1 (r_2^4 - r_1^4)$$

$$I_1 = \frac{\pi}{2} \left(8650 \frac{\text{kg}}{\text{m}^3} \right) (17.5 \text{ mm}) \left[\left(\frac{11 \text{ mm}}{2} \right)^4 - \left(\frac{5 \text{ mm}}{2} \right)^4 \right] \left(\frac{\text{m}}{1000 \text{ mm}} \right)^5$$

$$I_1 = 2.083 \times 10^{-7} \text{ kg} \cdot \text{m}^2$$

$$I_2 = \frac{\pi}{2} \rho_P L_1 (r_3^4 - r_2^4)$$

$$= \frac{\pi}{2} (1250) (17.5) \left[\left(\frac{17}{2} \right)^4 - \left(\frac{11}{2} \right)^4 \right] \left(\frac{1}{1000} \right)^5$$

$$I_2 = 1.479 \times 10^{-7} \text{ kg} \cdot \text{m}^2$$

9.127 cont.

$$I_3 = \frac{\pi}{2} \rho L_2 (r_4^4 - r_3^4)$$
$$= \frac{\pi}{2} (1250) (2) \left[\left(\frac{22}{2} \right)^4 - \left(\frac{17}{2} \right)^4 \right] \left(\frac{1}{1000} \right)^5$$

$$I_3 = 3.7 \times 10^{-8} \text{ kg-m}^2$$

$$I_4 = \frac{\pi}{2} \rho L_3 (r_5^4 - r_4^4)$$
$$= \frac{\pi}{2} (1250) (9.5) \left[\left(\frac{28}{2} \right)^4 - \left(\frac{22}{2} \right)^4 \right] \left(\frac{1}{1000} \right)^5$$

$$I_4 = 4.435 \times 10^{-7} \text{ kg-m}^2$$

$$I_{AA} = 8.367 \times 10^{-7} \text{ kg-m}^2$$