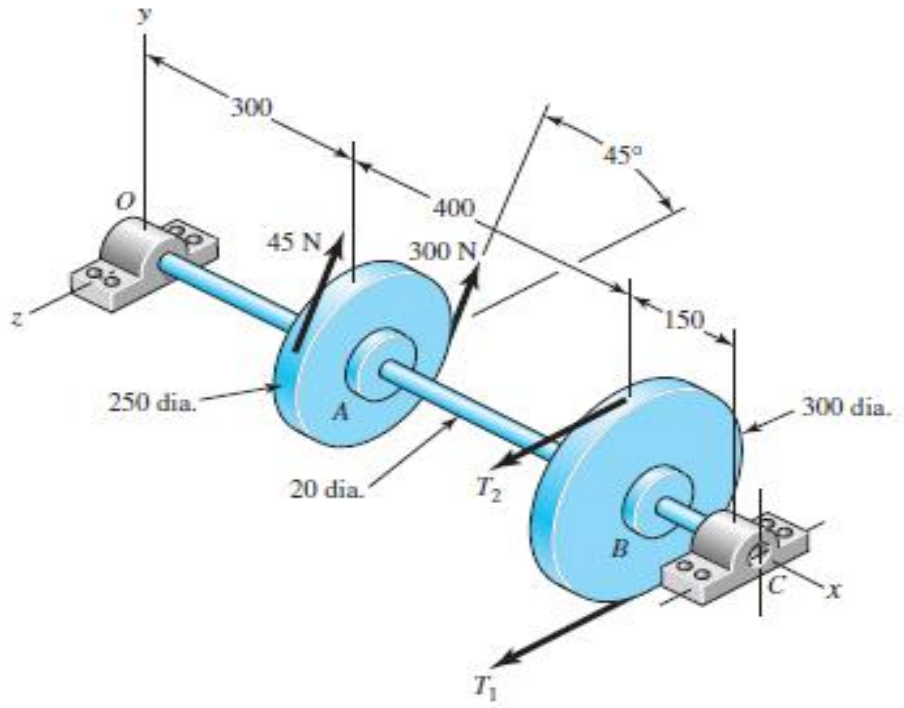
11-19

For the problem specified, build upon the results of the original problem to obtain a Basic Load Rating for a ball bearing at *C*. The shaft rotates at 1200 rev/min, and the desired bearing life is 15 kh. Use an application factor of 1.2.

Problem. 3-82

A countershaft carrying two V-belt pulleys is shown in the figure. Pulley *A* receives power from a motor through a belt with the belt tensions shown. The power is transmitted through the shaft and delivered to the belt on pulley *B*. Assume the belt tension on the loose side at *B* is 15 percent of the tension on the tight side.

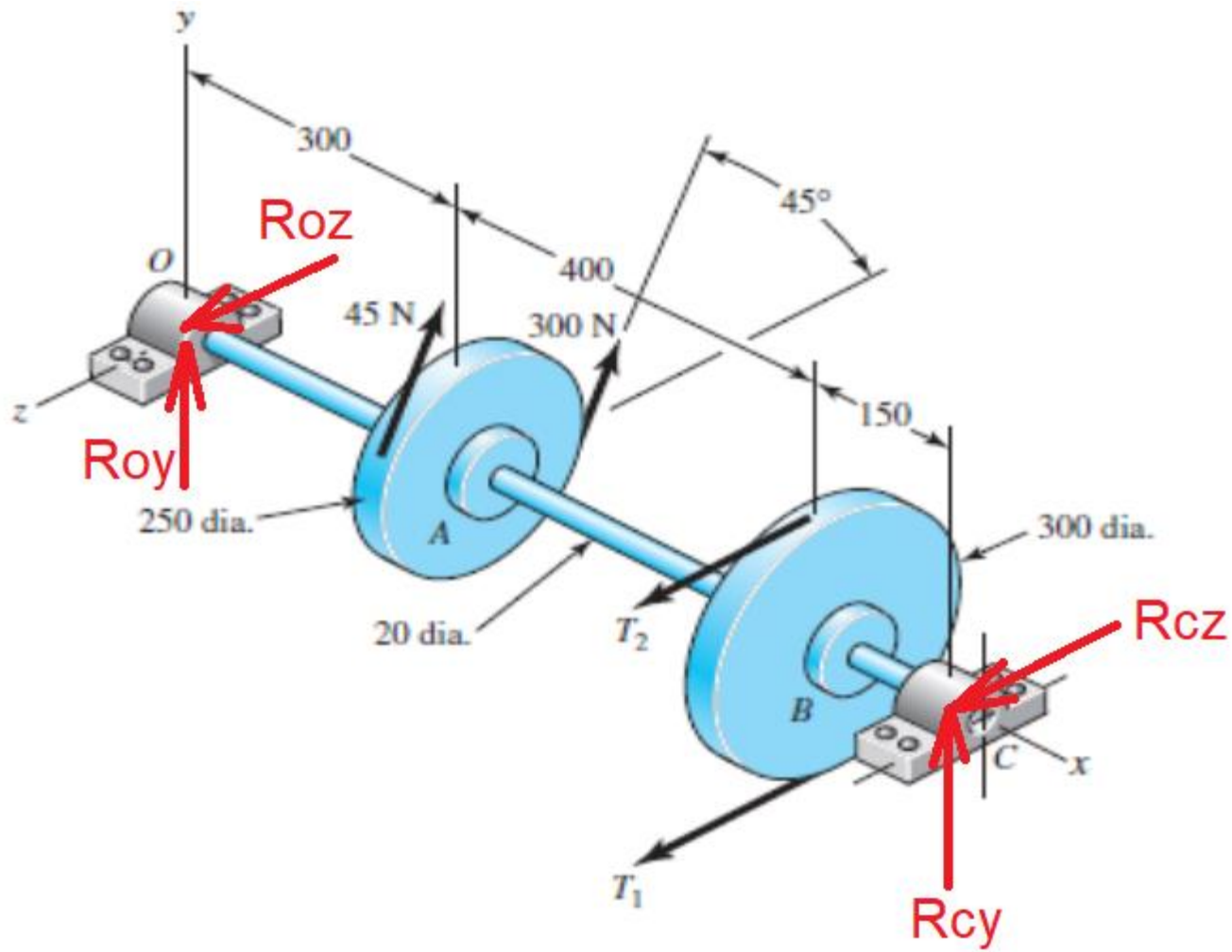


$$T_2 = 0.15T_1$$

$$\sum T = 0 = (300 - 45)(125) + (T_2 - T_1)(150) = 31\,875 + (0.15T_1 - T_1)(150)$$

$$31\,875 - 127.5T_1 = 0 \qquad \Rightarrow \qquad T_1 = 250 \text{ N}$$

$$T_2 = 0.15(250) = 37.5 \text{ N}$$



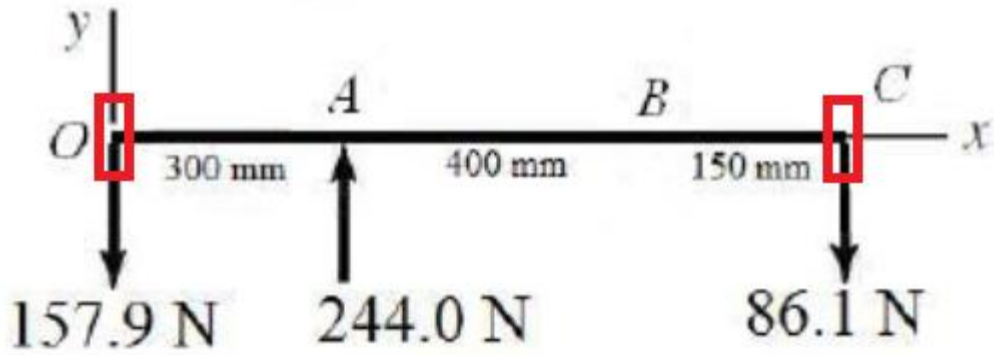
x-y plane:

$$\sum M_{Oz} = 0 = 345\sin 45^\circ (300) + R_{Cy}(850)$$

$$R_{Cy} = -86.10 \text{ N}$$

$$\sum F_y = 0 = R_{Oy} + 345\cos 45^\circ - 86.10$$

$$R_{Oy} = -157.9 \text{ N}$$



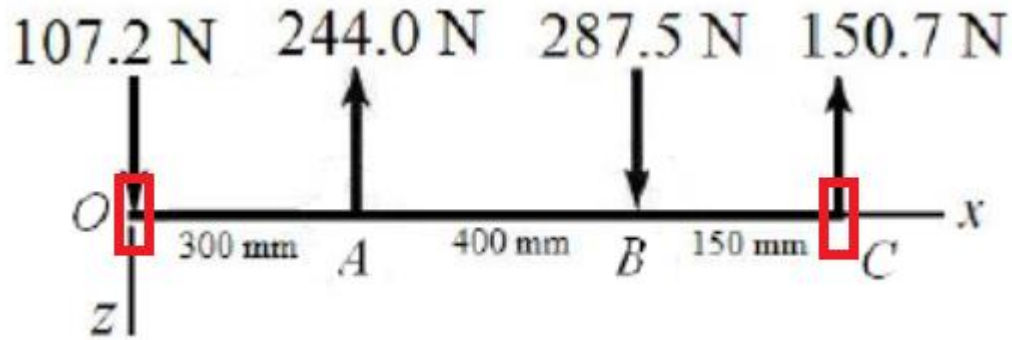
x-z plane:

$$\sum M_{Oy} = 0 = 345\sin 45^\circ (300) - 287.5(700) - R_{Cz}(850)$$

$$R_{Cz} = -150.7 \text{ N}$$

$$\sum F_z = 0 = R_{Oz} - 345\cos 45^\circ + 287.5 - 150.7$$

$$R_{Oz} = 107.2 \text{ N}$$



$$R_C = \left[(-150.7)^2 + (-86.10)^2\right]^{1/2} = 173.6 \text{ N}$$

$$= \text{Fe} = \text{F}_\text{D}$$

$$C_{10} = a_f F_D \left(\frac{L_D}{L_R}\right)^{1/a} = a_f F_D \left(\frac{\mathcal{L}_D n_D 60}{\mathcal{L}_R n_R 60}\right)^{1/a}$$

$$= 1.2(173.6)\left[\frac{15\,000(1200)(60)}{10^6}\right]^{1/3}$$

$$= 2137 \text{ N}$$