

Name: _____

A ball bearing is to be used on a shaft whose rotational speed is 60 revolutions-per-second and is to support a 600 pound radial load and a 400 pound thrust load. The bearing is to have a life of 5000 hours at a reliability of 99.9% and to fit on a shaft whose diameter is to be not less than 2.00 inch. Select the most economical radial ball bearing for this application using the Timken data.

$$\omega = 60 \text{ rev/sec}$$

$$= 3600 \text{ rev/min}$$

$$F_t = 400$$

$$F_r = 600$$

$$L = 5000 \text{ hours}$$

$$K_R = 0.21 \quad (99.9\%)$$

$$K_a = 1.0$$

$$C_{reg} = K_a F_e \left(\frac{L}{K_R L_R} \right)^{0.3}$$

$$F_t / F_r = 0.67$$

$$F_e = (600 \text{ lb}) \left(4.45 \frac{\text{N}}{\text{lb}} \right) [1 + 1.115 (.67 - .35)]$$

$$F_e = \begin{cases} 3622 \text{ N} \\ 3.6 \text{ kN} \end{cases}$$

$$L = (5000 \text{ hr}) \left(60 \frac{\text{min}}{\text{hr}} \right) \left(3600 \frac{\text{rev}}{\text{min}} \right)$$

$$L = 1080 \times 10^6 \text{ cycles}$$

$$C_{REQ} = (1)(3.6) \left[\frac{1080}{.21 \times 50} \right]^{0.3}$$

$$C_{REQ} = 12.2 \text{ kN}$$

$$\phi_{min} = 2.00 \text{ in} \approx 51 \text{ mm}$$

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