A shaft rotates at 1725 rpm and is to be simply supported by two, 25° angular-contact ball bearings. Both bearings are to support a radial load of 600 pounds, while one of them also supports a thrust load of 250 pounds. The design life is to be 5000 hours with the a gearing load which is considered to be moderate impact and a reliability of 95%. The design is to be “idiot-proofed” such that one bearing is to used in either location. Using the Timken data, select that bearing.
\[ \omega = 1725 \text{ rpm} \]
\[ L = 5000 \text{ hr} \]
\[ F_t = 250 \text{ lb} \]
\[ F_r = 600 \text{ lb} \]

\[ L = (1725 \frac{\text{rev}}{\text{min}}) (60 \frac{\text{min}}{\text{hr}}) (5000 \text{ hr}) \]
\[ L = 517.5 \times 10^6 \text{ cycles} \]

\[ C_{req} = K_a F_e \left( \frac{L}{K_r L_r} \right)^{0.3} \]

\[ K_a = 1.5 \]
\[ K_r = 0.62 \]
\[ L_r = 30 \times 10^6 \text{ cycles} \]
\[ \frac{F_t}{F_r} = \frac{250}{600} = 0.42 \]
\[ F_e = F_t \]

\[ C_{req} = (1.5) (600) (16 \times 4.45 \frac{N}{\text{lb}}) \left[ \frac{517.5}{0.62 \times 90} \right]^{0.3} \]

\[ C_{req} = 7.8 \text{ kN} \]

\[ L = 112 \text{ available} \]
\[ 20 \text{ } 30 \text{ } 6 \text{ bearings} \]