BEARING DATA
30 mm DIA
130 mm LONG
0.0015 CLEARANCE RATIO ($c_r$)
1500 rpm
ISO VG 100 OIL
200°F → 93°C (ASSUME THIS IS AVG. TEMP)
7KN LOAD

**SOMMERFELD NUMBER**

$$S = \left(\frac{1}{c}\right)^2 \frac{VN}{P} = \left(\frac{1}{0.0015}\right)^2 \frac{9 \times 10^{-3} N \text{ m}^2 \text{ sec}}{1.79 \times 10^6 N \text{ m}^2} \frac{25 \text{ rev}}{\text{sec}} = 0.056$$

$$V = 9 \times 10^{-3} \frac{N}{m^2 \text{ sec}}$$

$$N = 1500 \frac{\text{rev}}{\text{min}} \times \frac{1 \text{ min}}{60 \text{ sec}} = 25 \frac{\text{rev}}{\text{sec}}$$

$$P = \frac{7000 N}{(.030 m)(.130 m)} = 1.79 \times 10^6 \frac{N}{m^2}$$

**NOTE:** SOMMERFELD NUMBER FROM SOLUTIONS MANUAL IS CALCULATED FROM A DIFFERENT EQUATION AND IS 11 TIMES LARGER, $\pi(0.056) = 0.1750$ AS PER INSTRUCTIONS IN LECTURE, WE DISREGARD THE METHOD IN THE TEXT,

$$\frac{h_0}{c} \approx 0.3$$

(USING $\frac{L}{D} = 4.33$, AND CHART PG. BEARINGS-19)

$$\frac{c}{c_r} = c = 0.0015(.015 m) = 0.0000225 m$$

$$h_0 \approx 0.3(0.0000225 m) = 0.00000675 m = 6.75 \times 10^{-3} \text{mm} = 0.00027 \text{in}$$
FIND TORQUE AND POWER LOST IN BEARING

\[ S = 0.056 \]

FROM PG BEARINGS-21, \( \frac{f}{c} = 1.6 \quad \left( \frac{L}{D} = 4.33 \right) \)

\[ f \approx 1.6(0.0015) = 0.0024 \]

\[ T = f \omega r = 0.0024(7000N)0.015m = 0.252\text{Nm} \]

POWER LOST = \( f \omega r dN = 0.0024(7000N)\pi(0.030m)\frac{25\text{rev}}{\text{sec}} = 12.6\text{W} \)