
Problem : A vertical shaft 150 mm in diameter and rotating at 100 rpm rests on a flat end footstep bearing. The shaft carries.....

Question:

A vertical shaft 150 mm in diameter and rotating at 100 rpm rests on a flat end footstep bearing. The shaft carries vertical load of 20 kN. Assuming uniform pressure distribution and coefficient of friction equal to 0.05, estimate power lost in friction

Answer:

Given : $D = 150$ mm or $R = 75$ mm $= 0.075$ m ; $\mu = 0.05$

$N = 100$ r.p.m

$\omega = 2\pi \times 100/60$

$= 10.47$ rad/s ;

$W = 20$ kN $= 20 \times 10^3$ N ;

We know that for uniform pressure distribution, the total frictional torque,

$$T = \frac{2}{3} \times \mu W.R = \frac{2}{3} \times 0.05 \times 20 \times 10^3 \times 0.075 = 50 \text{ N-m}$$

$\therefore$ Power lost in friction,

$$P = T.\omega = 50 \times 10.47 = 523.5 \text{ W}$$ **Ans.**
