ME-340-01 MACHINE DESIGN

BEARINGS - POP QUIZ

NAME:_____

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A bearing has a 1.18 inch diameter, is 5.13 inches long, has a (r/c) ratio of 667, operates at 1500 rpm, and is lubricated with SAE 30 oil at a bulk temperature of 175F. Find the torque and power lost in the bearing if the bearing supports a load of 7-kN.

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HP

$L = 5.13$ $\omega = 1500$ rpm

$D = 1.18$ $N = 25$ rev/sec

$r = 0.59$

$L/D = 4.34$

SAE 30 @ 175°F: $\mu = 2.0 \times 10^{-6}$ reyn

$T = f W r$

$H = \frac{TN}{1050}$

$f \sim$ from $\left(\frac{r}{c}\right) f$

$W = (7 \times 10^3 \text{ N})(1 \text{ lb}/4.45 \text{ N})$

$W = 1{,}573$ lb

$S = \left(\frac{r}{c}\right)^2 \frac{\mu N}{P}$

$= (667)^2 \frac{(2 \times 10^{-6})(25)}{\left[\frac{1{,}573}{(5.13)(1.18)}\right]}$

$S = .085$

$\left(\frac{r}{c}\right)(f) = 20$

$f = .003$

$T = (.003)(1573 \text{ lb})(.59 \text{ in})$

$T = 2.8$ lb-in

$H = \frac{(2.8)(25)}{1050}$ $H = .07$ HP