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(2063)

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M.Tech 2nd Semester Examination

Industrial Tribology

PE-E12

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary continuation sheet will be issued.

Note : Attempt any five questions. All questions earn equal marks.

1. (a) What do you mean by con formal and non-conformal contacts? Explain with neat sketches.

   (b) Explain Tabor's model of friction. **(10,10)**

2. (a) What is the mechanism of abrasive wear? Explain 3-body abrasion wear.

   (b) What is the mechanism of abrasion in grinding wheels? **(10,10)**

3. (a) Differentiate between hydrodynamic and elasto-hydrodynamic lubrication.

   (b) Explain the phenomenon of squeeze film lubrication. **(10,10)**

4. Using Reynold's boundary condition, derive the equation for pressure distribution and load carrying capacity of a journal bearing. **(20)**

5. A full journal bearing appearing operates with the following data:

   Length of bearing = 0.15 m. Diameter of bearing = 0.10 m. Radial load on bearing = 22.70 kN, Speed of Journal = 250 rev/min, Radial clearance = 0.045 mm.

   It is desired to limit the minimum oil film thickness to 0.025 mm. Determine a suitable value for the viscosity of the lubricant and the power loss due to friction.

   The Sommerfeld equation and the relation for finding the co-efficient of friction are given below:

   $$\frac{Zn'}{P}\cdot\left(\frac{R}{C_r}\right)^2 = \frac{0.0823(2+\epsilon^2\sqrt{1-\epsilon^2})}{\pi^2\,\epsilon}$$

   and $f = \frac{0.326}{10^6}\cdot\left(\frac{zn}{p}\right)\cdot\left(\frac{D}{C_d}\right)+0.002$ where $\epsilon=$ eccentricity ratio. **(20)**

6. (a) What is cavitation in journal bearings? What are its ill effects?

   (b) Does turbulence help in the better operation of a hydrodynamic journal bearing? Explain. **(10,10)**

7. (a) What are various modes of failure of anti-friction bearings?

   (b) Explain various methods of lubrication of roller bearings. **(10,10)**

8. (a) What is pre-loading in anti-friction bearing?

   b) What are various materials used for manufacturing rolling element bearings? **(10,10)**