E

04ME 6509 Industrial Tribology

Max. Marks: 60   Duration: 3 Hours

Part A *(8x3=24 marks)*

1. Explain the various Laws of Friction.
2. What is the role/purpose of lubrication?
3. Explain the phenomenon of pressure build up in hydrodynamic bearing.
4. Derive Petroff's Equation for hydrodynamic Bearing.
5. Explain the function of Restrictor in Hydrostatic Lubrication System.
6. What are the advantages and limitations of Hydrostatic Bearing?
7. What you mean by Rated life of a bearing?
8. What you mean by Static and Dynamic Load Carrying Capacity in Roller Bearing?

Part B *(6x6=36marks)*

9. Derive Continuity equation in a column in Cartesian co-ordinates.

OR

10. Derive Reynolds equation in Cartesian coordinates.

11. What are the necessary properties that a lubricant should possess?

OR

12. Explain about the various types of lubrication.

13. Draw a neat sketch of a Hydrodynamic Journal Bearing with the pressure distribution and derive the expression for eccentricity ratio and minimum oil film thickness ratio.

OR

14. The following data is given for a 360^0 hydrodynamic bearing.

Radial Load = 3.2 kN,
Journal Diameter = 50 mm,
Journal Speed = 1490 rpm,
Bearing length = 50 mm,
Radial clearance = 50 µm,
Viscosity of lubricant = 25 cP,
Density of lubricant = 860 kg/m^3,

Specific heat of lubricant = 1.76 kJ/kg ^{0}c.

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing, calculate: (a) Coefficient of friction (b) Minimum oil film thickness (c) Power lost in friction (d) Total flow of lubricant and (e) temperature rise.

15. The following data is given for 360^0 hydrodynamic bearing:

   l/d = 0.5,
   Journal Diameter = 100 mm,
   Journal Speed = 1500 rpm,
   Minimum Oil Film Thickness = 15 microns,
   Viscosity of lubricant = 30 cP,
   Specific gravity of lubricant = 0.86,
   Specific heat of lubricant = 2.09 kJ/kg ^{0}c,
   Fit between journal & Bearing = H7E7.

Calculate (i) Load Carrying Capacity, (ii) Coefficient of friction, (iii) Total lubricant flow rate, (iv) Power lost in friction and (v) Temperature rise.

OR

16. Derive the expression for Power lost in friction, Heat generated, Heat dissipated and Temperature rise in hydrodynamic bearing.

17. Derive an expression for the energy losses in Hydrostatic bearing.

OR

18. Derive an expression for Pressure distribution and Flow rate of lubricant for Hydrostatic step bearing.

19. What are the various methods of controlling Abrasive, Adhesive and Erosive Wear?

OR

20. What are the various factors which affect Wear?