APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER M. TECH DEGREE EXAMINATION

Mechanical Engineering

(Machine Design)

04ME6509— Industrial Tribology

Max. Marks: 60 Duration: 3 Hours

PART A

Answer All Questions

Each question carries 3 marks

1. Explain three methods to study the topography of surface
2. Explain roughness, waviness and form error with neat sketch
3. With the help of Stribeck curve explain various regimes of lubrication
4. Explain the laws of sliding friction with their exceptions
5. Explain Bowden and Tabor Theory in detail.
6. Explain Dynamic, kinematic and absolute viscosity.
7. What are the advantages of hydrostatic lubrication over hydrodynamic lubrication?
8. Explain the classification of rolling element bearings

PART B

Each question carries 6 marks

9. Explain various theories of friction. Derive the expression for COF of a rigid conical asperity of semi angle α slides over a plane surface

OR

10. Derive generalized Reynold's equation in 2D

11. Derive the expression for pressure development and load carrying capacity in a plane slider bearing

OR

12. A 150mm diameter shaft supporting a load of 10 kN has a speed of 1500 r.p.m. The shaft runs in a bearing whose length is 1.5 times the shaft diameter. If the diametral clearance of the bearing is 0.15 mm and the absolute viscosity of the oil at the operating temperature is 0.011kg/m-s. Find the power wasted in friction.

13. What are the various types of lubricants used in the industry? Explain various methods used to measure viscosity of a lubricant.

OR

14. The following data is given for a 360º hydrodynamic bearing:

    Radial load = 2kN, journal diameter = 50mm, bearing length = 50 mm, viscosity of oil = 20 mPas

    Specify radial clearance that need to be provided so that when the journal is rotating at 2800 rpm, the minimum film thickness is 30 microns. Evaluate the corresponding coefficient of friction.

15. Explain the procedure followed in designing a journal bearing.

OR

16. What do you mean by reliability of a bearing? Also explain rating and minimum life of a bearing.

17. Find expression for load carrying capacity, pressure distribution, shear force and power loss due to viscous dissipation in hydrostatic thrust bearing

OR

18. For a hydrostatic thrust bearing, shaft dia = 300mm; recess dia =20mm; shaft speed = 100rpm; supply pressure = 500kN/m^2; recess pressure = 441kN/m^2; film thickness = 0.07mm; viscosity of the lubricant = 0.05Pa.s

    Find: i. Load carrying capacity, ii. Oil flow rate, iii. Power loss

19. Explain the types of wear occurring in industries in detail.

OR

20. A single row deep groove ball bearing is subjected to a radial force of 8kN and thrust force of 3kN. The shaft rotates at 1200 rpm. The expected rating life is 20000 hours. The minimum acceptable dia of shaft is 75mm.Select a suitable ball bearing for this application.