

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIRST SEMESTER M. TECH DEGREE EXAMINATION**

**Mechanical Engineering**  
**(Machine Design)**  
**04ME 6509 Industrial Tribology**

*Max. Marks: 60*

*Duration: 3 Hours*

**Part A**

*Answer All Questions*  
*Each question carries 3 marks*

1. List the various Laws of Friction.
2. What is the technical significance of lubrication?
3. Explain the importance of determining viscosity index
4. Write a short note on the pressure distribution in a Journal bearing.
5. Explain the method of selection of bearings.
6. Elucidate the significance of Bearing characteristic Number.
7. In a particular application, radial load on a ball bearing is 5 KN, Expected Life for 90% of bearing is 8000 hours. Determine dynamic capacity if shaft is running at 1500 rpm.
8. How to calculate the heat generated in a hydrodynamic bearing.

**PART B**

*Each question carries 6 marks*

9. Explain the various theories of friction

**OR**

10. Derive Continuity equation in a column in Cartesian co-ordinates.
11. Derive Petroff's Equation for hydrodynamic Bearing.

**OR**

12. List the various properties which a good lubricant should possess.
13. Derive the expression for Power lost in friction, Heat generated, Heat dissipated and Temperature rise in hydrodynamic bearing.

**OR**

14. Following data is given for a full Sommerfeld hydrodynamic journal bearing: Radial Load is 3.2kN, Journal Speed is 1490 rpm, Radial clearance is 0.05mm. Bearing Length is 50mm, Journal diameter is 50mm, Viscosity is 25cP. Assume that total heat generated is carried by total oil flow. Calculate the following: (A) Coefficient of friction, (B) Power loss in friction, (C) Minimum film thickness, (D) Flow requirement in litres per minute, (E) Temperature rise

15. Design a journal bearing for the following specifications: Speed = 900 rpm, Load = 12000N,  $l/d = 1$ ,  $c/d = 0.001$ , oil used is SAE 40, Temperature of oil =  $60^\circ\text{C}$ , Bearing pressure =  $15\text{N/mm}^2$ . Check for thermal stability. Assume ambient temperature =  $25^\circ\text{C}$ .

**OR**

16. Design a journal bearing for the following specifications: Speed = 1300 rpm, load = 900N,  $l/d = 1$ ,  $c/d = 0.001$ , bearing pressure =  $1\text{N/mm}^2$ , Oil used is SAE 30 at  $55^\circ\text{C}$  and ambient temperature =  $25^\circ\text{C}$ . Find the equilibrium oil temperature for thermal stability.

17. Derive an expression for pressure distribution in a hydrostatic bearing?

**OR**

18. Derive an expression for energy losses in a hydrostatic bearing?

19. Explain the various theories of failures?

**OR**

20. Explain in detail, the various factors affecting wear.