

(03 Hours)

[Total Marks: 80

- N.B.:
- (1) Attempt **any four** questions.
 - (2) Assumption made should be clearly stated.
 - (3) Use of Design Data Book is permitted.

1. A. Write short note on the followings: 10
 - i. Compensators in hydrostatic bearings
 - ii. Atomic force microscope
- B. A bearing is subjected to 5 kN radial load under minor shocks at 1550 rpm. Select an appropriate type of rolling contact bearing if the expected life is 1000 hours. 10
2. A. Write short note on the followings: 10
 - i. Spiral groove gas thrust and journal bearings
 - ii. Semisolid lubricants
- B. Design a hydrodynamically lubricated journal bearing for steam turbine shaft to support a radial load of 15 KN at 1550 RPM. The bearing is self-contained. Show thermal balance and analyze the operating parameters such as oil temperature, viscosity, flow rate, friction power loss, coefficient of friction, maximum pressure, minimum film thickness at equilibrium condition. 10
3. A. Write short note on the followings: 10
 - i. Foil gas lubricated bearings
 - ii. The hypothesis of Holm
- B. Write short note on the followings: 10
 - i. Philosophy of lubricant selection
 - ii. Failure criterion in hydrodynamic lubrication
4. A. Write short note on the followings: 10
 - i. Viscosity index
 - ii. Regimes in EHL contact
- B. Explain Dynamic viscosity, Kinematic viscosity, Relative viscosity, and Apparent viscosity with significance and units of each. 10
5. A. Write short note on the followings: 10
 - i. Bearing modulus
 - ii. Adhesive wear
- B. Derive Reynold's two dimensional equation and state the assumptions clearly made in deriving it. 10
6. A. Write short note on the followings: 10
 - i. Bio-tribology
 - ii. Bowden and Tabor's simple adhesion theory of friction
- B. A full journal bearing has following specifications: 10
 - a) Journal diameter, $D = 100$ mm
 - b) Bearing length, $L = 100$ mm
 - c) Radial clearance, $C = 0.055$ mm
 - d) Radial load, $W = 2.5$ kN
 - e) Absolute viscosity of oil = 0.016 PaSUsing Petroff's equation find the speed of the journal which corresponds to the coefficient of friction 0.05 and power loss at this speed.