

BALLARI INSTITUTE OF TECHNOLOGY & MANAGEMENT

(Autonomous Institute under Visvesvaraya Technological University, Belagavi)

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Course Code

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Seventh Semester B.E. Degree Examinations, February 2025

TRIBOLOGY

Duration: 3 hrs

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. Missing data, if any, may be suitably assumed

<u>Q. No</u>	<u>Question</u>	<u>Marks</u>	<u>(RBTL:CO: PI)</u>
<u>Module-1</u>			
1.	a. Define tribology. Briefly explain the practical applications of tribology.	10	(1 :1: 1.4.1)
	b. Define viscosity. State and explain Newton's law of viscosity, with neat sketch.	10	(2 :1: 1.4.1)
(OR)			
2.	a. Define lubrication. Briefly explain the properties of good lubricant.	10	(1 :1: 1.4.1)
	b. Explain with neat sketch construction and working of Saybolt viscometer.	10	(2 :1: 1.4.1)
<u>Module-2</u>			
3.	a. Define friction. List and explain types of friction measurement methods.	10	(1 :2: 1.4.1)
	b. Explain Bowden and Tabor's adhesion theory of friction.	10	(2 :2: 1.4.1)
(OR)			
4.	a. Define wear. List the different types of wear. Briefly explain any two types of wear.	10	(1 :2: 1.4.1)
	b. List various wear testing methods. With a neat sketch, explain abrasive wear testing method.	10	(2 :2: 1.4.1)
<u>Module-3</u>			
5.	a. Derive Petroff's equation for lightly loaded journal bearing. Also state the assumptions.	10	(3 :3: 1.4.1)
	b. A lightly loaded journal bearing has the following specifications: Diameter of journal = 50 mm, bearing length = 80 mm, diametral clearance ratio = 0.002, radial load = 750 N, Viscosity of lubricant = 10 Centipoise, Speed = 4000 rpm. Determine (i) Frictional force (ii) Frictional torque (iii) Coefficient of friction (iv) Power loss due to friction.	10	(3 :3: 1.4.1)
(OR)			
6.	a. Derive an equation for load carrying capacity of idealized journal bearing.	10	(2 :3: 1.4.1)

- b.** A full journal bearing having the following specifications: **10 (3 :3: 1.4.1)**
 Journal diameter: 45 mm, journal speed: 2800 rpm, radial load: 800 N,
 Viscosity of lubricant: 8.274×10^{-3} Pa-sec.
 Considering the bearing as lightly loaded, determine (i) Frictional Torque
 (ii) Co-efficient of friction (iii) Power loss in the bearing

Module-4

- 7. a.** Derive an equation for load carrying capacity of an idealized plane slider bearing with fixed shoe. **10 (3 :4: 1.4.1)**
- b.** Rectangular plane slider bearing with fixed shoe with no end leakage has the following data. **10 (3 :4: 1.4.1)**
 Bearing length = 90 mm, Width of shoe = 90 mm, load on bearing = 7800 N, slider velocity = 250 cm/sec, inclination = - 0.00035 rad, viscosity of oil = 40 Centipoise.
 Determine (i) Minimum oil film thickness (ii) Power loss
 (iii) Co-efficient of friction

(OR)

- 8. a.** Derive an expression for rate of oil flow in a hydrostatic step bearing. Also state the assumptions. **10 (3 :4: 1.4.1)**
- b.** The following data refers to hydrostatic step bearing: **10 (3 :4: 1.4.1)**
 Shaft speed = 720 rpm, shaft diameter = 500 mm, recess diameter = 350 mm, minimum oil film thickness = 0.15 mm, viscosity of the oil = 30 Cp, specific gravity of the oil = 0.86, specific heat of oil = 1.75×10^3 J/kg⁰c, supply pressure = 5 MPa Calculate (i) Load capacity (ii) Flow required
 (iii) Pumping power loss (iv) Fictional power loss (v) Total power loss.

Module-5

- 9. a.** List commonly used bearing materials. **05 (1 :5: 1.4.1)**
- b.** Briefly explain the properties of bearing materials. **05 (1 :5: 1.4.1)**
- c.** List the advantages and disadvantages of bearing materials. **10 (1 :5: 1.4.1)**
- (OR)**
- 10. a.** List different surface coating techniques. Explain any two surface coating techniques. **10 (1 :5: 1.4.1)**
- b.** Write a note on surface melting process and thermo chemical processes. **10 (1 :5: 1.4.1)**

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