

# CBCS SCHEME

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18ME822

**Eighth Semester B.E. Degree Examination, Dec.2023/Jan.2024**

## **Tribology**

Time: 3 hrs.

Max. Marks: 100

- Note :** 1. Answer any FIVE full questions, choosing ONE full question from each module.  
2. Use of design data handbook permitted.

### Module-1

- 1 a. Define the following :
- i) Tribology
  - ii) Viscosity
  - iii) Newtonian Fluid
  - iv) Fluidity
  - v) Viscosity Index. (10 Marks)
- b. Explain the effect of pressure and effect of temperature on viscosity. (06 Marks)
- c. Discuss the practical importance of Tribology. (04 Marks)

**OR**

- 2 a. With a neat sketch, explain the construction and working of Saybolt viscometer. (10 Marks)
- b. Explain the basic modes of Lubrication. (10 Marks)

### Module-2

- 3 a. Explain Bowden and Tabor's Adhesion theory of friction. (10 Marks)
- b. Define the term Friction. Explain the measurement of friction by an inclined plane test rig with sketch. (10 Marks)

**OR**

- 4 a. Define Wear. Explain briefly different types of wear. (10 Marks)
- b. What is Delamination theory of wear? Explain. (10 Marks)

### Module-3

- 5 a. State the assumptions and derive an expression for frictional force, torque and coefficient of friction for a lightly loaded journal bearing. (10 Marks)
- b. A full journal bearing has the following specifications :
- Diameter of shaft = 46mm ;
  - Bearing length = 66mm ;
  - Ratio of radial clearance to radius of journal = 0.0015 ;
  - Speed of rotating shaft = 2800 rpm ;
  - Radial load acts on shaft = 82 kgf ;
  - Viscosity of oil at operating temperature = 8.4 Cp.
- Consider the bearing as lightly loaded bearing. Determine the following :
- i) Frictional torque of journal
  - ii) Co-efficient of friction under the given condition
  - iii) Power loss of bearing. (10 Marks)

**OR**

- 6 State the assumptions and derive the Reynold's equation in two dimensions. (20 Marks)

**Module-4**

- 7 a. Derive an expression for the load carrying capacity of a plane slider bearing with a fixed shoe. (10 Marks)
- b. A rectangular slider bearing with fixed shoe has the following specifications :  
 Bearing length = 0.0762m ; Shoe width = 0.065m ;  
 Slider velocity = 2.54 m/sec ; Load acts on bearing = 5383.9N ;  
 Minimum film thickness =  $1.27 \times 10^{-5}$  m ;  
 Mean viscosity of oil = 0.06805 N-S/m<sup>2</sup>.  
 Find the inclination of the surface in radians and co-efficient of friction. (10 Marks)

**OR**

- 8 a. Derive an expression for rate of flow of oil through a hydro – static step bearing. (10 Marks)
- b. Following data refers to hydrostatic thrust bearing :  
 Shaft speed = 720 rpm ; Shaft diameter = 500 mm ; Recess diameter = 350 mm ;  
 Viscosity of an oil = 30 Cp ; Minimum oil film thickness =  $0.15 \times 10^{-3}$  m ;  
 Supplying pressure = 5 MPa.  
 Determine i) Load carrying capacity ii) Flow requirement  
 iii) Pumping power loss iv) Frictional power loss v) Total power loss. (10 Marks)

**Module-5**

- 9 a. Briefly explain any ten desirable properties of a good bearing materials. (10 Marks)
- b. Explain commonly used bearing materials in practice. (10 Marks)

**OR**

- 10 a. Explain briefly scope of Surface Engineering. (05 Marks)
- b. Write a short note on the following :  
 i) Vapor phase process.  
 ii) Wear and corrosion resistance for coating.  
 iii) Transformation hardening with respect to surface modification. (15 Marks)

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