

# CBCS SCHEME

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15ME742

## Seventh Semester B.E. Degree Examination, July/August 2021 Tribology

Time: 3 hrs.

Max. Marks: 80

- Note: 1. Answer any FIVE full questions.  
2. Use of Machine design data hand book is permitted.*

- 1 a. Explain the following:  
i) Oil bearings  
ii) Gas bearings  
iii) Elastohydrodynamic lubrication. (09 Marks)  
b. With suitable examples discuss the types of lubricants. (07 Marks)
- 2 a. Discuss the good properties of lubricants. (08 Marks)  
b. With help of neat sketch, explain the working of saybolt viscometer. (08 Marks)
- 3 a. Explain the friction theories. (08 Marks)  
b. With suitable sketches, explain the friction measurement methods:  
i) Inclined plane Rig ii) Pin-on-disc Rig. (08 Marks)
- 4 Explain the following:  
i) Abrasive wear mechanism  
ii) Adhesive wear mechanism  
iii) Surface fatigue wear mechanism  
iv) The delamination theory of wear. (16 Marks)
- 5 With assumptions derive Reynold's differential equation in Two dimensions for the pressure gradient in a converging oil film with no end leakage. (16 Marks)
- 6 a. Derive an expression for load carrying capacity of an idealized full journal bearing. (08 Marks)  
b. A full journal bearing has the following specification; diameter of journal = 75mm, length of bearing = 75mm, journal speed = 900rpm, diametral clearance = 0.0875mm, viscosity = 13cp and attitude = 0.75. Neglecting the effect of end leakage. Determine:  
i) Minimum film thickness  
ii) Load carrying capacity  
iii) Co-efficient of friction  
iv) Power loss. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 7 a. A plane slider with fixed shoe bearing has the following specifications; Bearing length = 90mm, Bearing width = 75mm, Load = 17.5kN, Velocity = 2.5m/s, Inclination = -0.00035 rad and Viscosity = 0.0445 Pa-s. Determine:
- Minimum film thickness
  - Power loss
  - Coefficient of friction. (08 Marks)
- b. A pivoted slider bearing has square shape and has the following specification, load = 15kN, velocity moving member = 5m/s, viscosity = 0.052 Pa-s and permissible minimum film thickness = 0.01875mm. Assume that the dimensionless variable  $q = 1$ . Determine,
- Required dimensions of the pad
  - Coefficient of friction
  - Power loss.
- Take into account of the influence of end leakages on performance of bearing. (08 Marks)
- 8 a. Derive the expression for rate of flow of oil through a Hydrostatic bearing. (08 Marks)
- b. A Hydrostatic step bearing for a turbine rotor has the following specifications. Diameter of shaft = 150mm, diameter of pocket = 100mm, vertical thrust on bearing = 70kN, shaft speed = 1000rpm, viscosity of lubricant under operating condition = 0.025 Pa-S and desirable minimum film thickness = 0.125mm. Determine:
- Rate of oil flow through the bearing
  - Power loss due to viscous friction
  - Co-efficient of friction. (08 Marks)
- 9 a. List the commonly used bearing materials and describe any of the five commonly with respect to their characteristics and advantages. (08 Marks)
- b. Explain the following:
- Nickel coating
  - Chromium coating on wear out surfaces. (08 Marks)
- 10 Explain with neat sketches the following:
- Plasma spraying
  - Chemical vapour deposition (CVD). (16 Marks)

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