

CBCS Scheme

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16MDE41

Fourth Semester M.Tech. Degree Examination, June/July 2018

Tribology and Bearing Design

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Define the following terms:
- Tribology
 - Wear
 - Viscosity
 - Newton's law of viscosity
- (08 Marks)
- b. Derive an expression for discharge through capillary tube with suitable assumptions. (08 Marks)

OR

- 2 a. Explain with neat sketches of any two types of viscometer. (08 Marks)
- b. A journal bearing has the following specifications:
- Shaft diameter = 60 mm
Bearing length = 80 mm
Radial load = 1 kN
Clearance (c) = 0.1 mm
Oil used SAE at 60°C, coefficient of friction 0.042. Determine:
- Speed of the journal
 - Power loss
- (08 Marks)

Module-2

- 3 Derive the expression for Reynolds equation in 2-dimensions and state the assumptions mode. (16 Marks)

OR

- 4 a. Derive an expression for the load carrying capacity of pivoted shoe slider bearing. (08 Marks)
- b. A rectangular plain slider bearing with fixed shoe with no end leakage has the following data:
- Bearing length = 90 mm
Width of shoe = 90 mm
Load on bearing = 7800 N
Slider velocity = 25 cm/sec
Inclination (α) = -0.0035 radians
Viscosity of oil $\eta = 40$ cp
- Determine: i) Minimum film thickness
ii) Power loss
iii) Coefficient of friction
- (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.

Module-3

- 5 a. What is the principle of hydrostatic bearing? Explain hydrodynamic lubrication system with neat sketches. (08 Marks)
- b. A hydrostatic step bearing has the following data:
 Diameter of the shaft = 150 mm
 Diameter of the pocket = 100 mm
 Vertical thrust on bearing = 60×10^3 N
 External pressure = Atmospheric pressure
 Shaft speed = 1500 rpm
 Viscosity of lubricant = 30 cp, desirable oil film thickness = 0.0125 cm. Determine:
 i) Rate of flow
 ii) Power loss due to friction
 iii) Coefficient of friction (08 Marks)

OR

- 6 a. A circular hydrostatic thrust bearing has the following data:
 Shaft dia = 300 mm
 Dia of pocket = 200 mm
 Shaft speed = 100 rpm
 Pressure at the pocket = 500 kN/m²
 Film thickness = 0.07 mm
 Viscosity of lubricant = 0.05 Pa.S
 Determine:
 i) Load carrying capacity
 ii) Oil flow rate
 iii) Power loss (08 Marks)
- b. Derive an equation for film thickness of a line contact bearing (Grubin type solution). (08 Marks)

Module-4

- 7 a. List the advantages of antifriction bearing and explain selection and nominal life of antifriction bearing. (08 Marks)
- b. Explain Fretting phenomenon and its stages of porous bearing. (08 Marks)

OR

- 8 a. Explain the following terms:
 i) Bearing mounting
 ii) Porous bearing (08 Marks)
- b. Explain static and dynamic load bearing capacity and also explain gas lubricated bearing. (08 Marks)

Module-5

- 9 a. Explain the following term:
 i) Magnetic bearing
 ii) Electrical analogy (08 Marks)
- b. Explain active magnetic bearing with neat labeled diagram. (08 Marks)

OR

- 10 a. Explain magneto-hydrodynamic bearing. (08 Marks)
- b. What are the advantages and disadvantages of magnetic bearing? (08 Marks)
