CBCS SCHEME

USN ☆

Fourth Semester M.Tech. Degree Examination, June/July 2019
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. Explain with sketches, the regimes of lubrication. **(08 Marks)**
   b. Explain the effect of temperature and pressure on viscosity of lubricating oils. **(04 Marks)**
   c. State and explain Newton's law of viscous flow. **(04 Marks)**

OR

2. a. Derive Hagen Poiseuilli law. State the assumptions made in the derivation. **(08 Marks)**
   b. An oil supply line 3m long and having an internal diameter 0.8mm and delivers 2 lt of oil/mm. The oil has viscosity of 0.065 pa.sec. Determine the pressure drop in the supply line. **(08 Marks)**

Module-2

3. With usual notations derive Reynold's equation in 2-D and also write the assumptions made in the derivation of Reynold's equation. **(16 Marks)**

OR

4. a. A rectangular plate slider bearing with fixed shoe has following details:
   Length of the bearing = 80mm
   Width of the bearing = 65mm
   Velocities = 2.5 m/sec
   Load = 15400N
   Viscosity of the oil is 68 cp
   Minimum film thickness = 0.013mm
   Determine:
   i) Inclination of surface in radians
   ii) Coefficient of friction under given operating condition
   iii) Power loss in the bearing. Neglect the effect of end flow. **(08 Marks)**
   b. A pivoted shoe slider bearing has square shape and has the following specifications load is 15kN, velocity of moving surface is 5m/sec. Viscosity is 0.032 pa.sec. permissible min film thickness is 0.01875mm. Assume that the dimensionless variable ie m = 1. Determine:
   i) Required dimensions of the shoe   ii) Coefficient of friction   iii) Power loss. Taking into account of end leakage performance. **(08 Marks)**

Module-3

5. a. Derive an expression for load carrying capacity and rate of flow of oil through a hydrostatic step bearing. **(08 Marks)**
   b. A hydrostatic step bearing has the following data, diameter of shaft = 150mm, diameter of pocket is 100mm, vertical thrust on bearing is 60kN speed of shaft is 1500rpm, $\mu = 30$cp, oil film thickness is 0.125mm. Determine rate of flow of oil, power loss due to friction and coefficient of friction. **(08 Marks)**

OR

6 a. Explain Elasto-hydrodynamic lubrication, with examples. Discuss in brief
   i) Different forms of EHL contacts   ii) Different regimes in EHL contacts.   (10 Marks)
   b. Write a note on rectangular pad bearings.   (06 Marks)

Module-4

7 a. Explain the following with respect to antifriction bearings:
   i)   Static and dynamic load bearing capacity
   ii)   Equivalent and cubic mean load
   iii) Bearing mountings.   (12 Marks)
   b. Discuss about the working principle of porous bearing.   (04 Marks)

OR

8 a. Discuss the advantages and disadvantages of   i) Gas lubricated bearing   ii) Anti friction
   bearing.   (08 Marks)
   b. Derive the governing equation of porous bearing.   (08 Marks)

Module-5

9 a. Explain with a neat sketch, the working of an active magnetic bearing.   (08 Marks)
   b. Explain the applications of magnetic bearing.   (08 Marks)

OR

10 Write short notes on:
   a. Analogy between electric and magnetic field.   (08 Marks)
   b. Explain advantages and disadvantages of magnetic bearings.   (08 Marks)

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