CBCS SCHEME

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18MDE23

Second Semester M.Tech. Degree Examination, Aug./Sept.2020
Tribology and Bearing Design

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 hand book is permitted.

Module-1

1 a. Discuss about the boundary lubrication conditions. **(06 Marks)**

b. Discuss the influence of temperature and pressure on the viscosity of oil. **(08 Marks)**

c. Two reservoirs are connected by capillary of size 0.635cm and length 2m. A fluid of 25×10^{-3} Pa.s is allowed to flow with a maximum velocity 127mm/s. If the flow is laminar, then determine the pressure difference. **(06 Marks)**

OR

2 a. State the assumptions and derive an expression of flow between two parallel stationary plates. **(10 Marks)**

b. A lightly loaded full journal bearing has the following specifications:
diameter, d = 50mm
length, L = 0.08m
Diametral clearance ratio = 0.002
radial load = 750N
viscosity of oil = 10cp
speed = 4000rpm
Determine: i) Frictional Torque ii) Coefficient of friction iii) Power loss. **(10 Marks)**

Module-2

3 a. A slider bearing with rectangular pivoted shoe has the following specifications:
Length in the direction of motion = 50mm
Width = 63.5mm
Velocity = 5.5m/s
Load acting = 8kN
Absolute viscosity = 30cp
Determine: i) Minimum film thickness ii) Power loss
Assume that inclination of bearing surface corresponds to minimum coefficient of friction. **(10 Marks)**

b. A journal bearing operating under steady load has the following specifications:
Diameter of journal = 63.5mm
Length of journal = 50mm
Radius of the bearing = 31.78175mm
Journal speed = 2000rpm
Load on the bearing = 9000N
Absolute viscosity of oil = 0.012 Pa.s
Assume that the angular length of load carrying oil film [oil film with positive hydrodynamic pressure] is 180°. Considering the influence of end flow on performance of bearing determine i) Minimum oil film thickness ii) Coefficient of friction iii) Power loss. **(10 Marks)**

OR

4 Derive Reynold's equation for 2-D flow. State the assumptions. **(20 Marks)**

Module-3

5 a. Derive an expression for discharge in hydrostatic thrust bearing. State the assumptions. **(10 Marks)**

b. A hydrostatic step bearing has the following specifications:
Runner diameter = 95mm
Pocket diameter = 63.5mm
Speed = 600rpm
External pressure is equivalent to atmospheric supply pressure = 3.6MPa
Flow of oil = $4 \times 10^{-4} m^3/s$
Oil film thickness = 0.127mm
Find:
i) Viscosity of oil under normal operating conditions
ii) Load carrying capacity
iii) Power loss. **(10 Marks)**

OR

6 a. With neat sketch, explain any two hydrostatic lubrication systems. **(10 Marks)**

b. Explain different regions of EHL contacts. **(10 Marks)**

Module-4

7 a. Explain antifriction bearings. Discuss applications of antifriction bearings. **(10 Marks)**

b. Write a note on:
i) Porous bearings
ii) Load capacity in antifriction bearing. **(10 Marks)**

OR

8 a. List out advantages and disadvantages of gas-lubricated bearings. **(10 Marks)**

b. Write a note on selection and nominal life of antifriction bearings. **(10 Marks)**

Module-5

9 a. Discuss the advantages of magnetic bearings considering their industrial application. **(10 Marks)**

b. Explain with a neat sketch, working of active magnetic bearing. **(10 Marks)**

OR

10 a. Classify magnetic bearings. Write the advantages and limitations of magnetic bearings. **(10 Marks)**

b. With a neat sketch, explain working of magnetic bearing. **(10 Marks)**

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