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10ME831

Eighth Semester B.E. Degree Examination, Dec.2018/Jan.2019**Tribology**

Time: 3 hrs.

Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.**
2. Use of design data handbook is permitted.

PART - A

- 1 a. Define Viscosity and explain its meaning through the flow between two parallel surfaces. (05 Marks)
b. Explain the effect of temperature and pressure on viscosity. (05 Marks)
c. State the assumptions and derive Hagen – Poiseuille's law for the flow through capillary tube. (10 Marks)
- 2 a. Indicating the assumptions, derive the Petroff's equation and the expression for co-efficient of friction for a lightly loaded journal bearing. (10 Marks)
b. A lightly loaded journal bearing is to support a radial load of 2kN. The diameter of the shaft is 50mm and length of the bearing is 60mm. The oil used is SAE 30 at 65°C. Find the co-efficient of friction and power loss in the bearing. If the speed of the journal is 750 rpm and the diametral clearance ratio is 0.001. (10 Marks)
- 3 Derive the Reynold's equation in 2D and state the assumptions made. (20 Marks)
- 4 a. Derive the expression for the load carrying capacity of a plane – slider bearing with fixed shoe. (10 Marks)
b. A slider bearing with a rectangular pivoted shoe has the following specifications :
Length of the shoe in the direction of motion = 75mm ; Width of the shoe = 112.5mm ;
Velocity of the moving member = 2 m/s ; Expected oil temperature = 70°C ;
Lubricating oil used = SAE40 ; Permissible min. oil film thickness = 0.0225mm.
Assuming the condition of bearing surface corresponding to max. load carrying capacity and considering end leakage, determine i) Load carrying capacity ii) Power loss
iii) Co-efficient of friction. (10 Marks)

PART - B

- 5 a. Write a note on thermal equilibrium of journal bearing. (10 Marks)
b. A full journal bearing with circumferential oil groove is lubricated under pressure and has the following specifications :
Journal diameter = 62.5mm ; Total length of bearing = 125mm Width of circumferential groove = 6.25mm ; Diametral clearance = 0.0875mm ; Effective oil temp. = 100°C ;
Lubricating oil = SAE20 ; Minimum oil film thickness = 0.004375 mm. Determine what inlet pressure required , if in order to control the bearing temperature the rate of oil flow through the bearing is to be 4925 mm³/s. (10 Marks)



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- 6 a. Derive an expression for the load carrying capacity of a hydrostatic step bearing. (10 Marks)
b. A hydrostatic circular thrust bearing has the following data :
Shaft diameter = 300 mm ; Diameter of pocket = 200 mm ; Shaft speed = 100 rpm ;
Pressure at the pocket = 500 kN/m² ; Film thickness = 0.07mm ; Viscosity of the
lubricant = 0.05 Pa.S. Determine i) Load carrying capacity, ii) Oil flow rate
iii) Power loss due to friction. (10 Marks)
- 7 a. Explain important properties of a bearing material. (10 Marks)
b. Explain the following types of wear with simple sketches
i) Adhesive wear ii) Abrasive wear iii) Erosive wear iv) Corrosive wear.
(10 Marks)
- 8 a. Briefly discuss behaviour of tribological components. (10 Marks)
b. Briefly explain
i) Improved design ii) Surface Engineering. (10 Marks)