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Eighth Semester B.E. Degree Examination, June / July 2013
Tribology

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, selecting atleast TWO question from each part.
2. Use of Tribology data handbook is permitted.

PART - A

- 1
 - a. State and explain the Newton's law of viscous flow. (06 Marks)
 - b. Derive the Hagen – Poiseuille law. Also state the assumptions made in the derivation. (10 Marks)
 - c. An oil supply line 1.2m long having an internal diameter 6.25mm and delivery $6 \times 10^{-5} \text{ m}^3/\text{s}$ of oil having a viscosity of 0.0555 Pa – S. Calculate the pressure drop in the supply line and energy required in forcing the oil through the supply line against viscous friction. (04 Marks)
- 2
 - a. Derive the Petroff's equation for a lightly loaded journal bearing. (08 Marks)
 - b. A lightly loaded journal bearing has the following specification :
Diameter of Journal = 50mm ; Bearing length = 80mm ; Diametral clearance ratio = 0.002
Radial load = 750N ; Viscosity of lubricant = 10Cp ; Speed = 4000rpm. Determine
i) Frictional torque on journal ii) Co – efficient of friction iii) Power loss. (12 Marks)
- 3 Derive the Reynold's equation in two dimensions. Also state the assumptions. (20 Marks)
- 4 Derive an analytical expression for pressure distribution along an idealized plane slider bearing with a fixed shoe. (20 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 ; Radial clearance = 0.04375mm ; Effective oil temperature = 100°C ; Lubricating oil = SAE20 ; Minimum oil film thickness = 0.004375mm.
Determine the inlet pressure required in order to control the bearing temperature. The rate of oil flow through the bearing is to be $4925 \text{ mm}^3/\text{s}$. (10 Marks)
- 6
 - a. Derive an expression for the rate of flow of the oil through a hydrostatic step bearing. (10 Marks)
 - b. A hydrostatic step bearing for a turbine rotor has the following specifications :
Diameter of shaft = 150mm ; Diameter of pocket = 100mm ; Vertical thrust of bearing = 70kN ; Shaft speed = 1000 rpm ; Viscosity of lubricant under operating condition = 0.025 fas – sec ; Desirable oil film thickness = 0.125mm. Determine i) Rate of oil flow through the bearing ii) Power loss due to viscous friction iii) co-efficient of friction. (10 Marks)

- 7 a. Enlist the properties of good bearing materials. (05 Marks)
b. List out the commonly used bearing materials. (05 Marks)
c. Give the classification of wear. Discuss in brief. (10 Marks)
- 8 a. Write short notes on wear of: i) Polymers ii) Ceramic materials. (10 Marks)
b. What are the technologies involved in surface engineering to improve tribological behaviour of components. (10 Marks)
