Eighth Semester B.E. Degree Examination, June 2012
Tribology

Time: 3 hrs.   Max. Marks:100

Note: *1. Answer FIVE full questions, selecting atleast*
TWO questions from each part.
2. Use of machine design data hand book is permitted.

PART – A

1 a. Define the following :
   i) Viscosity
   ii) Fluidity
   iii) Newtonian fluid
   iv) Viscosity index.   **(04 Marks)**

   b. Explain briefly the factors affecting viscosity.   **(06 Marks)**

   c. Explain with neat sketches the following viscosity measuring apparatus :
   i) MAC – MICHEL viscometer
   ii) Flowers viscometer.   **(10 Marks)**

2 a. A lightly loaded journal bearing has the following specifications :
   Journal diameter = 100 mm; Bearing length = 80 mm; radial clearance = 0.05 mm; radial load = 1000 N; absolute viscosity of oil = 0.015 pas – sec.
   Using Petroff's equation, determine :
   i) Speed of journal which corresponds to a co-efficient of friction of 0.4.
   ii) Power loss at this speed.   **(10 Marks)**

   b. An idealized full journal bearing has the following data :
   Diameter of journal = 50 mm; bearing length = 65 mm; speed = 1200 rpm; radial clearance = 0.025 mm; average viscosity = 0.001125 pas-sec; attitude = 0.8.
   Calculate :
   i) Load carrying capacity
   ii) Co-efficient of friction
   iii) Power loss in bearing.   **(10 Marks)**

3 a. List the assumptions made in the derivation of Reynolds equation in two dimension.
                                                                           (06 Marks)

   b. A 120° centrally loaded bearing has the following specifications :
   Diameter of journal = 100 mm; length of bearing = 130 mm; diameter clearance = 0.15 mm; oil used SAE 60; minimum film thickness = 0.0045 mm; speed of journal = 600 rpm; bearing operating temperature = 95°C ; considering end leakage determine :
   i) Load carrying capacity
   ii) Power loss in the bearing
   iii) Expected maximum pressure in the bearing.   **(14 Marks)**

4   Derive an expression for pressure distribution for a plane slider bearing with a fixed shoe.
                                                                           (20 Marks)

PART – B

5 A journal bearing operating under steady state condition has the following specifications.
Diameter = 100 mm, length = 105 mm, speed = 1600 rpm, radial clearance = 0.075 mm,
load = 27.3 kN, expected mean oil film temperature = 99°C, minimum film thickness must
not be less than 0.015 mm. The bearing is lubricated under pressure with inlet oil
temperature of 44°C. Determine :
  i)   Required viscosity of lubricating oil and kind of oil which should be used
  ii) Power loss
  iii) Inlet pressure required for cooling the bearing
  iv) Corresponding rate of flow. **(20 Marks)**

6 a. Derive an expression for load carrying capacity of a hydrostatic step bearing. **(10 Marks)**
   b. A hydrostatic step bearing for a turbine rotor has the following specification :
   Diameter of shaft = 150 mm; diameter of pocket = 100 mm; vertical thrust = 70 kN; shaft
   speed = 1000 rpm; viscosity = 0.025 pa. sec; oil film thickness = 0.125 mm.
   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. List any ten properties desirable for a typical bearing material. **(10 Marks)**
   b. Define wear. Discuss the different types of wear. **(10 Marks)**

8 a. Briefly discus behaviour of tribological components. **(10 Marks)**
   b. Briefly explain the improved design and surface engineering. **(10 Marks)**

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