10ME831

Eighth Semester B.E. Degree Examination, June/July 2017
Tribology

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE full questions, selecting*
at least TWO questions from each part.
2. *Use of tribology data hand book is permitted.*

PART – A

1 a. Derive Hagen-Poiseuille law. Also state the assumptions.   **(10 Marks)**
     b. Explain with neat sketches:
        (i)   Torsion wire viscometer.
        (ii)   Falling sphere viscometer.   **(10 Marks)**

2 a. Derive the Petroff's equation and expression for coefficient of friction in lightly loaded bearing with assumptions.   **(10 Marks)**
     b. Compute the frictional torque and power loss in lightly loaded bearing with following specifications :
        Journal radius = 10×10^{-3} m, Bearing length = 24×10^{-3} m, Journal speed = 3000 rpm, Nominal clearance = 24×10^{-6} m, Oil viscosity = 28×10^{-3} N-S/m^2 **(10 Marks)**

3 Derive the Reynold's equation in two dimensions. Also state the assumptions.   **(20 Marks)**

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

PART – B

5 a. Write a note on thermal equilibrium of journal bearing.   **(10 Marks)**
     b. The main bearing for a stationary slow speed. Steam engine has the following data:
        Journal diameter = 200 mm, Maximum load on piston = 80 KN, Engine speed = 200 rpm, Diametrial clearance ratio = 0.0009. Determine heat generated and heat disipiated, given temperature operating = 65˚C, ambient temperature = 25˚C, Attitude = 0.8, Absolute viscosity = 60×10^{-3} pa.S, assume as square bearing.   **(10 Marks)**

6 a. Derive an expression for load carrying capacity of hydrostatic bearing.   **(10 Marks)**
     b. A hydrostatic step bearing for a turbine rotor has the following specifications:
        Diameter of shaft = 150 mm, Diameter of pocket = 100 mm, Vertical thrust of bearing = 70 KN, Shaft speed = 1000 rpm, Viscosity = 0.025 pa.sec, film thickness = 0.125 mm. Determine (i) Rate of oil flow, (ii) Power loss (iii) Coefficient of friction.   **(10 Marks)**

7 a. Explain briefly commonly used bearing materials (any five).   **(10 Marks)**
     b. Explain briefly any five properties of bearing materials.   **(10 Marks)**

8 Write short notes on:
     a. Wear of ceramic materials.
     b. Improved design.
     c. Material selection.
     d. Surface engineering.   **(20 Marks)**

* * * * *