USN | | | | | | | | | | 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*
atleast 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 – Poisulle'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 65^0C. 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 = 70^0C ;
        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. = 100^0C ;
        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 mm^3/s.   **(10 Marks)**

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/m^2 ; 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)**

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