GIET UNIVERSITY, GUNUPUR – 765022
M. Tech (Second Semester Examinations) – October' 2021
MPEMD2031 – TRIBOLOGY IN DESIGN
(Machine Design)

Time: 2 hrs   Maximum: 50 Marks

(The figures in the right hand margin indicate marks)
PART – A

Q.1. Answer *ALL* questions   (2 x 10 = 20)
  a. What is a self-lubricating bearing and how does it function?
  b. How the sliding speed effect on co-efficient of friction?
  c. Explain wear of ceramic materials
  d. Why hydrostatic journal bearing is called externally pressurized bearing?
  e. What is meant by hydrodynamic lubrication?
  f. Write Reynolds's equation for Hydrodynamic journal bearings?
  g. State the properties of a sliding contact bearing material?
  h. What is the difference between air film lubrication and oil lubrication?
  i. What do you mean by surface contaminants? What is their effect on surface contacts?
  j. Comment on liquid lubricant shear stress?

PART – B   **(6 x 5 = 30 Marks)**
Answer *ANY FIVE* questions   Marks

2. Derive an expression for load carrying capacity of an infinitely long journal bearing. Use   (6)
    full Sommerfeld and half Sommerfeld's condition.

3. The thrust of propeller shaft in a marine engine is taken up by a number of collars integral   (6)
    with the shaft which is 300 mm is diameter. The thrust on the shaft is 200 KN and the
    speed is75 r.p.m. Taking μ constant and equal to 0.05 and assuming the bearing pressure
    as uniform and equal to 0.3 N/mm2. Find:

    i.   Number of collars required
    ii.   Power lost in friction and 3. Heat generated at the bearing in kJ/min.

4. State the different theories of friction. Explain any one of them which is most widely   (6)
    accepted with neat sketch.

5. A journal bearing with a diameter of 200 mm and length 150 mm carries a load of 20 kN,   (6)
    when the journal speed is 150 r.p.m. The diametral clearance ratio is 0.0015. If possible,
    the bearing is to operate at 35°C ambient temperature without external cooling with a
    maximum oil temperature of 90°C. If external cooling is required, it is to be as little as
    possible to minimise the required oil flow rate and heat exchanger size.

    i.   What type of oil do you recommend?
    ii.   Will the bearing operate without external cooling?
    iii. If the bearing operates without external cooling, determine the operating oil
          temperature?

6. Write Short Notes on: (6)

    i.   Idealized Journal Bearings.
    ii.   Elasto-hydrodynamic lubrication

7. Define viscosity. State and explain the effect of temperature and pressure on viscosity   (6)

    of lubricating oils.

8. What are the practical considerations to be made while designing bearings. Discuss such   (6)
    considerations in brief as related to size, clearance and load.

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