SEAT No. :

P3648

[Total No. of Pages : 3

[4859]-1018

B.E. (Mechanical) (End Semester)
TRIBOLOGY
(2012 Pattern) (Elective - I)

Time : 2½ Hours]   *[Max. Marks : 70*

Instructions to the candidates:
1) *Write Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10.*
2) *Figures to the right indicate full marks.*
3) *Assume suitable data, whenever necessary.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Use of logarithmic tables, slide rule Mollier charts, electronic pocket calculator and steam tables is allowed.*

Q1) a) Explain the use of following additives.   **[6]**
   i)   E.P. additives
   ii) Anti-friction additives
   iii) Anti-wear additives

   b) Define friction. Explain basic modes of lubrication.   **[4]**

OR

Q2) a) Explain the following terms of lubrication with their units.   **[6]**
   i)   SUS
   ii) Kinematic Viscosity
   iii) Viscosity Index
   iv) Absolute Viscosity
   v)   Specific heat
   vi) Relative Density

   b) Define 'wear'. What are the parameters which govern the wear.   **[4]**

Q3) a) What is the effect of temperature and pressure on viscosity of lubricating oil?   **[2]**

   b) Differentiate between long journal bearing and short journal bearing. **[4]**

   c) Explain the working principal of hydrodynamic bearing.   **[4]**

P.T.O.

OR

Q4) a) What do you mean by stick-slip friction? **[2]**

   b) Derive from basic principles two dimensional Reynolds equation taking usual notations. **[8]**

Q5) a) Derive the expression for flow rate through rectangular slot. What are the assumptions made while deriving the equation? **[8]**

   b) Explain in brief the working principle of hydrostatic bearing. State the advantages and limitations of hydrostatic bearing. **[8]**

OR

Q6) a) Derive an equation for load carrying for given instantaneous velocity of approach and film thickness in case of circular plate approaching a plane. **[8]**

   b) The following data is given for a hydrostatic step bearing : **[8]**

   Thrust load = 400 kN

   Shaft speed = 700 rpm

   Shaft diameter = 480 mm

   Recess diameter = 240 mm

   Oil-film thickness = 0.15 mm

   Viscosity of lubricant = 160 SUS

   Specific heat of lubricant = 1. 76 kJ/kg°C

   Specific gravity of lubricant = 0.86

   Calculate :
   i)   The supply pressure
   ii)   The flow requirement in 1/min
   iii) The fractional power loss
   iv)   The pumping power loss and
   v)   The temperature rise, assuming the total power loss in bearing is converted into the frictional heat.

Q7) a) How Elastohydrodynamic lubrication differs from hydrodynamic lubrication? Also Explain the Ertel-Grubin equation with its limitation in brief. **[8]**

   b) State the merits , demerits and four applications of gas lubricated bearings. **[8]**

OR

Q8) a) What do you understand by gas lubricated bearings? Compare gas lubricated bearings with oil lubricated bearings based on the following parameters:

    i)   Viscosity of lubricant

    ii)   Viscous resistance

    iii)   Frictional power loss

    iv)   Operating speed

    v)   Load carrying capacity

    vi)   Film thickness and surface finish. **[8]**

   b) Explain in brief about the active and passive magnetic bearings. What are its advantages over conventional bearings. **[8]**

Q9) Write a short note on the following (Any Three) : **[18]**

   a) Lubrication in rolling and forging.

   b) Tribological aspects of wheel on rail road.

   c) Hybrid bearing

   d) Mechanics of tyre road interaction.

OR

Q10) a) Classify the Surface Engineering processes in detail. **[6]**

   b) Explain with neat sketch the Electroplating process **[6]**

   c) Explain in brief about porous bearing and foil bearing. **[6]**

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