

Total No. of Questions : 10]

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 l/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]

