

Total No. of Questions : 10]

SEAT No. :

P4764

[Total No. of Pages : 4

[5561]-543

B.E. (Mechanical) (Semester - II)

TRIBOLOGY

(2015 Pattern) (Elective - III)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Write Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of electronic pocket calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

Q1) a) List the various physical and chemical properties of lubricant and explain any five of them. **[6]**

b) List the different theories of wear and explain Archard's wear theory in brief. **[4]**

OR

Q2) a) What is the difference between gasket and oil seal? Explain non-metallic gasket. **[4]**

b) List the different methods to measure friction and explain pin-on-disc rig. **[6]**

Q3) a) What are the factors affecting wear? **[2]**

b) What do you understand by infinitely long journal bearing and infinitely short journal bearing? Comment on pressure gradient and load carrying capacity in both cases. **[8]**

OR

Q4) a) Differentiate between real and apparent area of contact. **[2]**

b) A 360° hydrodynamic journal bearing has 50 mm diameter and 50 mm length. The journal is carrying a load of 15 kN and rotating at a speed of 1450 rpm. The eccentricity ratio is 0.75. if the radial clearance is 20 microns, **[8]**

P.T.O.

Calculate :

- i) The minimum oil-film thickness;
- ii) The viscosity of oil;
- iii) The quantity of oil in circulation;

Q5) a) Derive an equation for load carrying capacity for given instantaneous velocity of approach and film thickness in case of circular plate approaching a plane. **[10]**

b) Explain squeeze film lubrication. State and explain any six practical examples of squeeze film. **[8]**

OR

Q6) a) Derive equation for friction and pumping power losses in hydrostatic bearings. **[8]**

b) Following data is given for a hydrostatic thrust bearing : **[5]**

Supply pressure = 5 N/mm²

Shaft diameter = 400 mm

Specific gravity of oil = 0.86

Specific heat of oil = 1.76 kJ/kg °C

Oil viscosity = 30 cP

Film thickness = 0.15 mm

Find :

- i) The load carrying capacity of bearing;
- ii) The flow requirement in l/min;
- iii) The frictional power loss;
- iv) The pumping power loss, and
- v) The temperature rise

Assume that the total power loss in the bearing is converted into frictional heat.

- c) The two parallel plates of 30 mm length and infinite width are separated from the plane by an oil- film of 25 μm thickness and having viscosity of 0.65 N-s/ m^2 . If the normal load per unit width of 15 kN/m is applied on the plate, determine : [5]

- i) The time required to reduce the film thickness to 2.5 μm
- ii) The maximum pressure

Q7) a) Write short notes on [8]

- i) Gas lubricated bearings
 - ii) Features of gas lubricated bearings
- b) What do you understand by gas lubricated bearings? Compare gas lubricated bearings with oil lubricated bearings based on following parameters [8]
- i) Viscosity of lubricant
 - ii) Viscous resistance
 - iii) Frictional power loss

OR

Q8) a) Write Ertel-Grubin equation with all specific terms and also write the limitations of this equation. [8]

- b) Explain in brief, working principle of hydrostatic gas lubricated bearings. [8]

Q9) a) Write short note on: selection of coatings. [8]

- b) State and discuss the lubricant and lubricating method for gears. [8]

OR

Q10) Write short notes on :

[16]

- Lubricant and lubricating method for rope and chain
- Lubrication system in I.C. engine

$\frac{l}{d}$	$\frac{h_0}{c}$	ϵ	S	$\left(\frac{r}{c}\right)f$	$\frac{Q}{rcn_s l}$	$\frac{Q_s}{Q}$	$\frac{P_{max}}{P}$
1	0.00	1.00	0.0000	0.000	0.000	1.0000	0.0000
	0.03	0.97	0.00474	0.514	4.820	0.973	6.579
	0.10	0.90	0.0188	1.050	4.740	0.919	4.048
	0.20	0.80	0.0466	1.700	4.620	0.842	3.195
	0.40	0.60	0.1210	3.220	4.330	0.680	2.409
	0.60	0.40	0.2640	5.790	3.990	0.497	2.066
	0.80	0.20	0.6310	12.800	3.590	0.280	1.890
	0.90	0.10	1.3300	26.400	3.370	0.150	1.852
	1.00	0.00	∞	∞	3.142	0.0000	0.0000

