Total No. of Questions : 10]

SEAT No. :

P2229

[Total No. of Pages : 4

[5254]-560 -B
B.E. (Mechanical Sandwich) (Semester -II)
TRIBOLOGY (Elective -II)
(2012 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer any three questions.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables and electronic pocket calculator is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Discuss the effect of following on coefficient of friction between two surfaces- **[4]**

i) Surface finish

ii) Sliding velocity

b) Explain different regimes of hydrodynamic lubrication with the help of Sribeck curve. **[6]**

OR

Q2) a) What is friction? Explain the laws of dry friction. **[4]**

b) Show that the volume of abrasive wear per unit sliding distance with conical abrasive particles is given by- **[6]**

$$Q = \left[\frac{2k_w \cot\alpha}{\pi}\right]\frac{W}{P}$$ with usual notations

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Q3) a) Using diagram show the pressure distribution along the axis and the circumference in infinitely narrow/short hydrodynamic journal bearing.**[4]**

b) Explain the importance of recycling of used oils. Explain different ways of disposal of used oil. **[6]**

OR

Q4) a) Following data is given for full hydrodynamic journal bearing. **[10]**

Radial load of	= 3.2 kN
Journal speed	= 1440 r.p.m.
Journal diameter	= 50 mm
Bearing length	= 50 mm
Viscosity of lubricating oil	= 20 cP
Radial Clearance	= 0.05 mm

Assuming that the total heat generated in the bearing is carried by the total oil flow in the bearing. Use Raimondi and Boyd chart given in table no.-I and calculate:

i) Minimum oil film thickness

ii) Total oil flow in litter/minutes,

iii) Side leakage,

iv) Maximum oil film pressure,

v) Eccentricity,

vi) Angle of eccentricity or attitude angle

Table no.-I Dimensionless performance parameters for full hydrodynamic journal bearing.

I/d	ε	h_o/c	S	Φ	(r/c)f	Q/rcn_sI	Qs/Q	p/p_{max}
	0.1	0.9	1.33	79.5	26.4	3.37	0.150	0.540
	0.2	0.8	0.631	74.02	12.8	3.59	0.280	0.529
	0.4	0.6	0.264	63.10	5.79	3.99	0.497	0.484
1	0.6	0.4	0.121	50.58	3.22	4.33	0.680	0.415
	0.8	0.2	0.0446	36.24	1.70	4.62	0.842	0.313
	0.9	0.1	0.0188	26.45	1.05	4.74	0.919	0.247
	0.97	0.03	0.00474	15.47	0.514	4.82	0.973	0.152

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

b) A circular plate is approaching an oily fixed plane surface with velocity 'V' at the instant, the film thickness is h_1, if both the surfaces are separated by a lubricant of viscosity 'μ'. Derive the expression for the time 't' taken to reduce the film thickness from h_1 to h_2. **[10]**

OR

Q6) a) Derive relation for load carrying capacity in terms of supply pressure for thrust bearing. **[12]**

b) State and explain different types of energy losses in hydrostatic bearing. **[6]**

Q7) a) Explain the phenomenon of Elastohydrodynamic lubrication [EHL] and how it differs from hydrodynamic lubrication. State the applications of EHL. **[8]**

b) Explain gas lubricated bearings and state advantages and disadvantages/ limitations of gas bearings. **[8]**

OR

Q8) a) Explain the significance of the Hertz theory in Elastohydrodynamic Lubrication. Write Ertel -grubin equation with all specific terms and also write the limitations of this equation. **[8]**

b) Explain the working principle of active and passive magnetic bearing. Also mention its types. **[8]**

Q9) a) What are the different Properties and parameters of coatings, explain in brief. **[10]**

b) Explain the mechanics of tyre-road interactions. **[6]**

OR

Q10) Write a note on following:

a) Foil bearing **[5]**

b) Lubrication requirements in case of Rolling operation **[5]**

c) Cladded Coating **[6]**

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