Total No. of Questions : 12]

SEAT No. :

P1698

[Total No. of Pages : 5

[4859]-38
B.E. (Mechanical)
TRIBOLOGY
(2008 Course) (402044 (D)) (Elective - I) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer any 3 questions from section I and 3 questions from sections II.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) State and explain applications and importance of tribology in industries. **[7]**

b) Give a comparison of sliding and rolling contact bearings with reference to the following points: **[9]**

i) Magnitude of load

ii) Nature of load

iii) Speed

iv) Life

v) Frictional loss

vi) Space requirement

vii) Positional accuracy

viii) Noise

ix) Cost

OR

P.T.O.

Q2) a) Explain the use of following additives: **[8]**

i) Anti-wear additives

ii) Anti-foam additives

iii) Anti-friction additives

iv) Anti-scuff additives

b) Explain the importance of recycling of used oils. Explain different ways of disposal of used oil. **[8]**

Q3) a) Using the Bowden and tabor's theory of simple adhesion prove that coefficient friction due to adhesion is $f_a = \frac{kS_{sy}}{S_{yc}}$ and $fa = 0.1667$ for $k = 0.5$ with usual notations **[10]**

b) Discuss the effect of following on coefficient of friction between two surfaces **[6]**

i) Surface finish,

ii) Sliding velocity

OR

Q4) a) Show that the volume of abrasive wear per unit sliding distance with conical abrasive particles is given by **[8]**

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

b) Draw and explain the classification of wear measuring machines along with sketches of at least four types. **[8]**

Q5) a) State assumptions in Reynolds equation and Derive from basic principle two dimensional Reynolds equation. **[14]**

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

OR

Q6) a) Using diagram show the pressure distribution along the axis and circumference in infinitely long hydrodynamic journal bearing. **[4]**

b) Following data is given for hydrodynamic full journal bearing **[14]**

Radial load of	=	10 kN
Journal speed	=	1440 r.p.m.
Viscosity of lubricating oil	=	30 m Pa s
Unit bearing pressure	=	1000 k Pa
Clearance ratio (r/c)	=	800

Assuming that the total heat generated in the beraing is carried by the total oil flow in the bearing. Use given data in **Table No. - 1** and calculate:

i) The dimension of bearing,

ii) The coefficient of friction,

iii) The power lost in friction,

iv) Total oil flow in litter/minutes,

v) Side leakage,

vi) Temperature rise.

Table 1 Dimensionless performance parameters for full journal bearing with side flows

$\left(\frac{l}{d}\right)$	ε	$\left(\frac{h_0}{c}\right)$	S	ϕ	$\left(\frac{r}{c}\right)f$	$\left(\frac{Q}{rcn_s l}\right)$	$\left(\frac{Q_s}{Q}\right)$	$\left(\frac{p}{p_{max}}\right)$
∞	0	1.0	∞	(85)	∞	π	0	–
	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
	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
	1.0	0	0	0	0	0	1.0	0

SECTION - II

Q7) Following data is given for a hydrostatic thrust bearing **[18]**

Thrust load	=	450 kN
Shaft speed	=	750 r.p.m.
Shaft diameter	=	400 mm
Recess diameter	=	250 mm
Viscosity of lubricant	=	30 cP
Specific Gravity of lubricant	=	0.86
Specific heat of lubricant	=	2 kJ/kg°C

Draw a neat sketch showing the effect of film thickness on energy losses.

Calculate:

a) The optimum oil film thickness for minimum power loss,

b) The total power loss,

c) The temperature rise, assuming the total power loss in bearing is converted into frictional heat.

OR

Q8) a) A circular plate is approaching an oily fixed plane surface with velocity 'V' at the instant, the film thickness is h1, 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 h1 to h2. **[12]**

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

Q9) a) Write short note on: lubrication in Rolling and Extrusion with neat sketch. **[8]**

b) Write short note on: **[8]**

i) Labyrinth seal

ii) Metallic Gasket

OR

Q10)a) What is self lubricating bearing? Discuss the property of any two materials which are used for making self lubricating bearing. **[8]**

b) Explain requirements of Gas lubrication and its merits, demerits and application. **[8]**

Q11)a) Define the term 'Superficial layers', discuss the development of concept and structure of superficial layers. **[10]**

b) Explain electroplating and also write its advantages and limitations. **[6]**

OR

Q12)a) What are the different parameters of coating, explain in brief. **[6]**

b) Write short note on Cladded Coating and Metal Spraying. **[10]**