Seat No.: _____   Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2013

Subject code: 710905N   **Date: 17-06-2013**
Subject Name: Tribology
Time: 10.30 am – 01.00 pm   **Total Marks: 70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Explain the different configurations of hydrodynamic journal bearings with neat sketches (atleast five).   **07**

(b) Explain the effect of C/d ratio and L/d ratio on the performance of hydrodynamic journal bearing.   **07**

Q.2 **(a)** Explain the EHD lubrication in detail.   **07**

(b) Derive the formula for load carrying capacity of hydrostatic bearing with rectangular step (slot)   **07**
$$Q = ê\, pbh^3/12\ l$$

OR

(b) The hydrostatic thrust bearing (circular) of a generator consists of six pads has the following data: **07**
Total thrust load = 450 kN   shaft diameter = 400 mm
Viscosity of the lubricant = 30 cP   recess diameter =250 mm
Shaft speed =750 r.p.m.
 Find (i) supply pressure (ii) the optimum film thickness for minimum power loss.

Q.3 **(a)** Discuss the different bearing materials.   **07**

(b) Classify the lubricants. Explain the different types of grease stating their properties and specific uses.   **07**

OR

Q.3 **(a)** Explain the following :   **07**
   i. Recycling of used oil.
   ii. Gear lubricants.

(b) List and explain the factors affecting selection of bearing materials.   **07**

Q.4 **(a)** Discuss the cases on lubrication problems faced at extreme high temperature environmental conditions.   **07**

(b) Design a journal bearing from the given specifications: **07**
Load on journal = 7 kN   Diameter of journal = 50 mm
Speed of journal = 1800 rpm   Clearance ratio = 0.001
Permissible bearing pressure = 1.4 N/mm^2
L/d ratio = 2   Ambient temperature = 35 ^{0}C.
Z.N / p = 28 (where p is MPa),   Operating temperature = 75 ^{0}C.
Temperature rise for oil is limited to 10 ^{0}C
Oil SAE10 Viscosity at 75 ^{0}C = 0.011 kg/m-sec
Heat dissipation coefficient = 1230 W/ m^2 / ^{0}C
Specific heat of oil = 1900 J/Kg/ ^{0}C

OR

Q.4 **(a)** The following data refers to a 360^0 hydrodynamic bearing: **07**

Journal diameter = 50 mm   Bearing length = 50 mm

Radial load = 3.2 kN   Journal speed = 1490 r.p.m.

Radial clearance = 0.05 mm   oil viscosity = 25 cP

Find the minimum oil film thickness, friction coefficient, oil flow, temperature rise and power lost in churning.

l/d	h_0/c	S	CFV= f(r/c)	FV = Q /rcnl
1	0.4	0.121	3.22	4.33
	0.6	0.264	5.79	3.99
	0.8	0.631	12.8	3.59

(b) Derive Reynold's equation for hydrodynamic journal bearing foe three dimensional flow. **07**

Q.5 **(a)** Explain the following surface characteristics: **07**
Sampling length, waviness and surface roughness.

(b) Explain wear particle analysis ferrography. **07**

OR

Q.5 **(a)** Explain the design of variable speed drive elements. **07**

(b) Write a detailed note on coating for wear resistance. **07**

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