Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 710905N **Date: 06-01-2014**

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 EHD lubrication in detail. **07**

(b) Explain different methods of oil lubrication with neat sketches.. **07**

Q.2 **(a)** What is the tribology? Suggest the various tribological solutions for overcoming friction and wear. **07**

(b) Discuss effect of pressure and temperature on viscosity of the lubricating oil. **07**

OR

(b) Classify the lubricants. Explain the lubricating oils and its selection in detail along with their applications. **07**

Q.3 **(a)** Derive the equation of load carrying capacity of hydrostatic step bearing. **07**

(b) The hydrostatic step bearing (circular) of a vertical turbo-generator: **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) the optimum film thickness for minimum power loss (ii) supply pressure

OR

Q.3 **(a)** State the assumptions made in derivation of Reynolds's equation for hydrodynamic journal bearings. Derive the Petroff's equation for hydrodynamic journal bearings. **07**

(b) Draw a neat sketch of hydrostatic bearing and state its advantages and disadvantages. Compare hydrostatic bearing and hydrodynamic bearings. **07**

Q.4 **(a)** List and explain the factors affecting selection of bearing materials. **07**

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

Journal diameter = 40 mm Bearing length = 20 mm

Radial load = 6.5 kN Journal speed = 1500 r.p.m.

Radial clearance = 0.007 mm Oil viscosity = 25 cP

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

l/d	h_0 /c	S	CFV= f(r/c)	FV = Q /rcnl
½	0.4	0.319	8.10	4.85
	0.6	0.779	17	4.29
	0.8	2.03	40.9	3.72

OR

Q.4 **(a)** Explain the factors affecting selection of antifriction bearing with a flowchart. **07**

(b) Design a 360^0 hydrodynamic bearing from the following given data for machine tool application: **07**

Journal diameter = 75 mm Bearing material - Babbit

Radial load = 10 kN Journal speed = 1440 r.p.m.

minimum oil film thickness = 22.5 Microns
inlet temp of oil = 40^0 C
Calculate the length of the bearing and select the suitable for this application.

Q.5	**(a)**	Explain the different configurations of hydrodynamic journal bearings with neat sketches (at least four).	**07**
	(b)	Explain the concept of wear particle analysis ferrography.	**07**

OR

Q.5	**(a)**	Explain the effect of C/d ratio and L/d ratio on the performance of hydrodynamic journal bearing.	**07**
	(b)	Write a detailed note on: lubrication problems faced at extreme high temperature environmental conditions.	**07**

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