Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015

Subject code: 710905 **Date: 15/12/2015**

Subject Name: Tribology

Time: 10:30 AM to 1:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Draw neat sketches wherever necessary to justify answers.**

Q.1 **(a)** Define the tribology and state and explain the main areas of tribology giving their importance. State the practical applications of tribology in industries. **07**

(b) Explain the different configurations of hydrodynamic journal bearings with neat sketch. **07**

Q.2 **(a)** Explain the step by step procedure used for selection of antifriction bearings. **07**

(b) Explain the concept of wear particle analysis ferrography in detail. **07**

OR

(b) List and explain the factors affecting wear rate. Also explain the coating for wear resistance. **07**

Q.3 **(a)** Derive from basic principles 3-D Reynoldôs equation taking usual notation stating the different assumptions. **07**

(b) 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 = 0.050 mm Oil viscosity = 25 cP

l/d	h_0 /c	S	CFV= f(r/c)	FV = Q /rcnl
1	0.4	0.121	3.22	4.33

Find the following: (i) Minimum oil film thickness (ii) friction coefficient (iii) total flow of lubricant in lit/min and (iv) power lost in friction.

OR

Q.3 **(a)** Derive Petroffôs equation for hydro journal bearings mentioning different assumptions made. **07**

(b) Design a journal bearing for a centrifugal pump for given specifications: **07**

Load on journal = 20 kN Diameter of journal = 100 mm

Speed of journal = 900 rpm Clearance ratio = 0.0013

Permissible bearing pressure = 0.7 to 1.4 N/mm^2 (Range)

L/d ratio = 1 to 2 (Range) Ambient temperature = 15.5 ^{0}C.

Z.N / p = 28 (where p is MPa), Operating temperature = 70 ^{0}C.

Temperature rise for oil is limited to 10 ^{0}C

Oil SAE10 Viscosity at 55 ^{0}C = 0.017 kg/m-sec

Heat dissipation coefficient = 1232 W/ m^2 / ^{0}C

Specific heat of oil = 1900 J/Kg/ ^{0}C

Q.4 **(a)** Explain the elasto-hydrodynamic lubrication (EHD) in detail stating its examples. **07**

	(b)	Explain regimes of lubrication with the help of neat sketch.	**07**
		OR	
Q.4	**(a)**	State the different functions of the lubricants and their important properties of lubricants in detail.	**07**
	(b)	Explain the following in respect to surface characteristics: (i) Waviness (ii) Surface roughness (iii) Bearing area curve (iv) CLA & RMS (v) Tribo system	**07**
Q.5	**(a)**	Explain the diagnostic maintenance of tribological components and considerations in IC engines and automobile parts.	**07**
	(b)	Explain the air/gas bearing in detail with neat sketch.	**07**
		OR	
Q.5	**(a)**	Derive the equation for load carrying capacity of hydrostatic static step bearing with neat sketch.	**07**
	(b)	State the different theories of friction. Explain any one of them which is widely accepted with neat sketch.	**07**

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