Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 171905 **Date: 29/05/2012**

Subject Name: Industrial Tribology

Time: 02:30 pm – 05:00 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)** State the different theories of friction. Explain any one of them which is most widely accepted with neat sketch. **07**

(b) Define absolute and kinematic viscosity. Also define viscosity index. Discuss the effect of temperature on absolute viscosity of the lubricating oil. **07**

Q.2 **(a)** Explain the air/gas bearing in detail. **07**

(b) State the different functions of the lubricants. Explain grease as lubricant in detail. **07**

OR

(b) Why additives are added in lubricants? Give the names of few additives and their functions. **07**
Classify the lubricants.

Q.3 **(a)** Explain the EHD (elasto hydrodynamic) lubrication in detail. State the different examples of it. **07**

(b) Explain the wear of metals and non-metals. **07**

OR

Q.3 **(a)** Explain the diagnostic maintenance of tribological components and considerations in IC engines and automobile parts. **07**

(b) Explain the following (any ONE) : **07**

1. Measurement of wear
2. Recycling of used oils

Q.4 **(a)** Derive Reynold's equation for 3-D hydrodynamic lubrication. Also state the assumptions made in this derivation. **07**

(b) Explain oil whip and whirl. **07**

OR

Q.4 **(a)** Derive Petroff's equation for lightly loaded bearing. **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

Q.5 **(a)** State and explain general requirements of good bearing materials. **07**

(b) The following data refers to a hydrostatic thrust bearing: **07**

Thrust load = 500 kN | Shaft speed = 720 r.p.m.
Recess diameter = 300 mm | Shaft diameter = 500 mm
Film thickness = 0.15 mm | Viscosity of lubricant = 29.3 cP

Calculate the supply pressure, flow requirement in lit/min and power loss in pumping.

OR

Q.5 **(a)** Write short note on the following (any ONE) : **07**

1. Selection of bearing.
2. Lubrication systems.

(b) Explain the optimum design of hydrostatic step bearing. **07**

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