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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Eighth Semester, B.E. - Mechanical Engineering

Semester End Examination; July - 2023

Tribology

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Define friction, laws of friction and different types of wear and wear mechanisms. Explain surface texture a roughness characteristics using its measuring techniques.

CO2: Explain the properties of lubricants and classify them. Develop Hagen-Poiseuille law.

CO3: Explain the concept of lightly loaded bearings and Develop Petroff's equation and limits of hydrodynan lubrication.

CO4: Develop expressions for pressure distribution, load carrying capacity, coefficient of friction, friction resistance in an idealized slider bearing.

CO5: Develop expressions for pressure distribution, load carrying capacity and oil flow through the hydrodynan journal bearing, hydrostatic step bearing. Explain working of porous bearing with equation and types hydrostatic lubrication systems.

***Note**: **I) PART - A** is compulsory. **Two** marks for each question.*

***II) PART - B**: Answer any **TWO** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

***III)** Use of Design Data handbook is Permitted.*

Q. No.		Questions	Marks	BLs	COs	POs
		I : PART - A	**10**			
1	a.	Classify types of function and wear.	2	L1	CO1	PO1
	b.	Define terms; i) Viscosity Index and ii) Oilness	2	L1	CO2	PO1
	c.	List different types / regimes of lubrication.	2	L1	CO3	PO1
	d.	List the advantages of pivoted shoe bearings.	2	L1	CO4	PO1
	e.	List the applications of hydrostatic bearings.	2	L1	CO5	PO1
		II : PART - B	**90**			
		UNIT - I	**18**			
2	a.	Define wear. Explain any four types of wear.	9	L2	CO1	PO2
	b.	Define tribology and explain various theories of friction.	9	L2	CO1	PO2
	c.	Explain why surface roughness measurement is important and stylus method to measure it.	9	L2	CO1	PO2
		UNIT - II	**18**			
3	a.	List and explain the desirable properties of lubricants.	9	L2	CO2	PO2
	b.	Explain with neat sketch Saybolt universal viscometer.	9	L2	CO2	PO2
	c.	Explain the concept and derive the expression for the flow through capillary tube	9	L2	CO2	PO2

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	UNIT - III	**18**				
4 a.	List the assumptions and derive the Petroff's equation for lightly loaded bearing.	9	L2	CO3	PO3
b.	Explain with neat sketch mechanism of pressure development in an oil film.	9	L2	CO3	PO2
c.	A lightly loaded full journal bearing has the following specifications; bearing diameter = 80 mm, bearing length = 60 mm, diameter clearance = 0.012 mm, Journal speed = 24000 rpm, viscosity of lubricating oil = 4 cP. Radial load = 900 N. Determine; i) Torque ii) Coefficient of friction iii) Frictional force iv) Power loss	9	L3	CO3	PO3
	UNIT - IV	**18**				
5 a.	Derive an expression for pressure distribution in a fixed-shoe plane slider bearing.	9	L2	CO4	PO3
b.	Derive the expression for load carrying capacity of a pivot shoe plane slider bearing.	9	L2	CO4	PO3
c.	A slider bearing having rectangular shoe has the following specifications; length of shoe in the direction of motion 100 mm, width of shoe 120 mm, velocity of moving member 2 m/sec expected temperature of oil film 70°C. Permissible film thickness 0.02 mm, lubricating oil is automobile oil SAE 40, q = 1.4, determine; i) Load carrying capacity ii) Coefficient of friction iii) Load carrying capacity and coefficient of friction if film thickness is 0.03 mm	9	L3	CO4	PO2
	UNIT - V	**18**				
6 a.	Derive an expression for load carrying capacity of a hydrostatic bearing.	9	L2	CO5	PO3
b.	Derive an expression for Sommerfeld number and explain its significance.	9	L2	CO5	PO3
c.	Explain the working of porous bearings with the equations used for design of porous bearings.	9	L2	CO5	PO2

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