Seat No. | | | | | | |

DBI1380

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Tribology
(New) (1300)

P. Pages : 3

Time : Three Hours | Max. Marks : 100

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answersheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub question from each unit.
5. Use of design data book is allowed.
6. Use of electronic calculator is allowed.
7. Assume suitable data if necessary.

UNIT - I

1. a) Define 'Tribology. With examples, discuss economic importance of Tribology. **10**

b) What are the essential features of Friction measuring device. Explain any four methods of friction measurement, with neat sketches. **10**

c) Write short notes on. **10**
i) Adhesive wear ii) Abrasive wear.

UNIT - II

2. a) What is lubricant ? State and explain physical and chemical properties of lubricants. **10**

b) i) State applications of hydrostatic bearings. **4**

ii) Derive relation for oil flow rate and pressure distribution over an annular ring of hydrostatic step bearing. **6**

iii) Following data is given for a hydrostatic thrust bearing. **10**

Supply pressure	= 50 bar
Shaft speed	= 100 r.p.m.
Shaft diameter	= 500 mm
Recess diameter	= 300 mm
Viscosity of lubricant	= 35 mPa - S
Specific gravity of lubricant	= 0.86
Specific heat of lubricant	= 2 kJ/kg °C

Calculate :

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i) The load carrying capacity,
ii) The optimum oil - film thickness
iii) The total power loss ;
iv) The flow rate of lubricant in ℓ /min, and
v) The temperature rise, assuming the total power loss in bearing is converted into the frictional heat.

UNIT - III

3. a) Derive from basic principles two dimensional Reynold's equation taking usual notations. **10**

b) Write short notes on. **10**
i) Design considerations in hydrodynamic journal bearing.
ii) Temperature rise in hydrodynamic journal bearing.

c) A 360° journal bearing has the following features. **10**

i)	Ratio of bearing length to journal diameter	= 0.5
ii)	Bearing length	= 25 mm
iii)	Radial load	= 5 kN
iv)	Journal speed	= 1000 rpm
v)	Radial clearance	= 0.05 mm
vi)	Oil viscosity	= 30 cP.

Find :

i) Friction coefficient. ii) Oil flow
iii) Eccentricity iv) Power in churning.

UNIT - IV

4. a) Write short notes on, **10**
i) Tapered land thrust bearing.
ii) Spring mounted thrust bearing.

b) Explain the type of oil grooves used in bearing with neat sketches. **10**

c) The hydrodynamic tapered - pad bearing operators under following conditions : **10**

Thrust load on bearing	= 200 kN
Length to width ratio	= 5
Maximum oil - film thickness	= 0.075 mm
Minimum oil - film thickness	= 0.025 mm
Sliding velocity	= 2 m/s
Viscosity of lubricating oil	= 52.5 cP

Calculate :

i) The dimensions of bearing pad.

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ii) The coefficient of friction, and.
iii) The maximum pressure and its location.

UNIT - V

5. a) Derive an expression for squeeze load capacity of circular plate. **10**

b) i) Explain merits and demerits of Gas bearing. **5**

ii) Why lubrication is required in metal working ? Explain the type of lubrication in metal working. **5**

c) i) Two circular disks of radius 150 mm are separated by an oil - film of 0.2mm thickness. The viscosity of oil is 40 cP. Calculate the time required for the oil - film to reduce its thickness to 0.02 mm, if the disk carry a load of 15000 N. **4**

ii) A Circular plate of 60 mm radius is approaching the base plane at a velocity of 150 mm/s at the instant when the oil - film thickness is 0.2 mm. If the absolute viscosity of the oil is 0.025 Pa - S, Calculate.
i) The load carrying capacity of the oil - film at the given instant.
ii) The maximum pressure ; and
iii) The average pressure. **6**

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