

Name :

Roll No. :

Invigilator's Signature :

CS/B.Tech (ME/PE)/SEM-8/ME-805/2010

2010

TRIBOLOGY & TERO-TECHNOLOGY

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

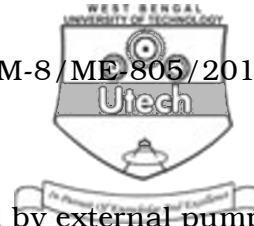
1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) Acquisition cost concerning life cycle to include :
 - a) R & D, Management & engineering, design and prototyping, testing and evaluation. plant facilities, overhead, marketing and distribution.
 - b) Manpower, operation, facilities, raw materials & consumable, training & repair & maintenance.
 - c) Salvage/disposal value, production, repair resources, cost due to time loss due to repair/maintenance.
 - d) None of these.



- ii) Tribology includes interaction between
- a) friction, maintenance management and reliability
 - b) friction, wear and lubrication
 - c) wear, preventive maintenance and maintainability
 - d) all of these.
- iii) Causes of friction depend on
- a) adhesion theory, sliding velocity, tangential force & surface interaction behaviour
 - b) adhesion theory, asperity inter-locking theory, molecular attraction theory and stick-slip theory.
 - c) sliding friction, rotary friction and sticking friction
 - d) surface interaction behavior due to temperature rise, vibration, wear & lubrication.
- iv) Which of the following devices transmit power by friction ?
- a) Spur gear
 - b) Bevel gear
 - c) Chain drives
 - d) Belt drive.
- v) Profilometer is instrument used to measure
- a) Gear involute
 - b) Taper
 - c) Thread profile
 - d) Surface roughness.
- vi) Wear is due to
- a) adhesive, erosive and friction
 - b) adhesive, friction, lubrication and slippage
 - c) adhesive, erosive, abrasive, corrosive, fatigue, fretting, impact and other
 - d) none of these.



vii) In hydrodynamic bearing

- a) the oil film presence is generated by external pump
- b) the oil film presence is generated by dead weight of shaft
- c) the oil film presence is generated only when the shaft rotates
- d) the oil film is sufficient thick.

viii) In a full journal bearing, the angle of contact of the bearing with the journal is

- a) 120°
- b) 180°
- c) 270°
- d) 360° .

ix) In oil less bearing

- a) there is no external supply of lubricant
- b) the lubricant is achieved by adding solid lubricant
- c) grease is used for lubrication
- d) none of these.



- x) Equipment record to consists
- a)
 - i) Name of the equipment
 - ii) Maintenance procedure
 - iii) Break down attended
 - iv) Optional procedure.
 - b)
 - i) Instruction manual
 - ii) Drawing
 - iii) Inspection register
 - iv) Equipment history.
 - c)
 - i) Name of the equipment
 - ii) Supplier name & order no.
 - iii) Date of commissioning & cost
 - iv) Drawing no. if any.
 - d)
 - i) Log book
 - ii) Name of the equipment
 - iii) Cost
 - iv) Sr. of the machine.
- xi) Life cycle cost to include
- a)
 - i) Salvage cost
 - ii) Disposal cost
 - iii) Support cost
 - iv) Operational cost.
 - b)
 - i) Acquisition cost
 - ii) Operational cost
 - iii) Failure cost
 - iv) Support cost-net salvage cost.
 - c)
 - i) Cost due to R & D
 - ii) Support or repair and maintenance
 - iii) Disposal cost
 - iv) Manufacturing cost.
 - d) None of these.



xii) Break down maintenance means

- a) corrective action
- b) repair under taken whenever the equipment fails
- c) lost production time
- d) all of these.

xiii) When MTBF is increased, the reliability will

- a) uncertain
- b) remain constant
- c) increase
- d) decrease.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- 2. a) Give any five examples that show the importance of friction in manufacturing process.
- b) List manufacturing operations where high friction is desirable, those where low friction desirable.
- 3. a) What is meant by surface integrity, surface texture ?
- b) Sketch the feature which exists at and just below a metal surface.



4. a) Give examples of manufacturing operation where wear is undesirable.
- b) Give examples where wear is desirable.
5. Explain briefly the basic system cued features of working of TPM in any industry.
6. a) What is condition monitoring and equipment health monitoring ?
- b) What is lubrication monitoring ? What is the normal procedure of such monitoring ?

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Describe flow analysis of lubricant through of an ordinary circular step bearing. 6
- b) A 175 mm dia. shaft of an unventilated journal bearing supporting a load of 20 kN has a speed of 1500 rpm. The length of journal is 1.5 times the shaft diameter. If the diametric clearance of the bearing is 0.15 mm and absolute viscosity of the oil at the operating temperature is 0.012 kg/m-s, find the power wasted in friction. 9



8. a) Define reliability, availability and maintainability. 4
 b) Describe a case of Life Cycle Cost (LCC) concerning procurement of a Bicycle based on the following available data : 11

	Parameters	Break up detail	Cycle-1	Cycle-2
A.	Capital cost	Cycle (including-Frame, handle, paddle, chain, sprocket, rim, tyre, chain guard, mud guard, breaks, seat, etc Extra : Carrier, lock & key, bell, Dynamo-light, handle cover.	Rs.2,400/- Rs. 400/-	Rs.3,000/- Rs. 450/-
B.	Scrap value	Expected to recover at the end of 10 years	Rs. 800/-	Rs.1,000/-
C.	Operating cost	Against fuel if any	Nil	Nil
D.	Maintenance cost	i) Service : (Six monthly maintenance) cleaning, lubrication, puncture. ii) Random break down : (Chain-sprocket tightening, free wheel, spokes, breaks & ball bearing replacement, etc)	@ Rs.120/- @ Rs.200/- yearly	@ Rs.120/- @ Rs.250/- every 2-years
E.	Misc.	Insurance / Tax / Bank loan	Nil	Nil
F.	Expected life		10 years	10 years



9. a) What is STRIBECK curve ? Explain. 5
- b) Elucidate Hertzian contact deformation. 5
- c) Out-line the importance of Ferrography study. 5
10. a) What is Preventive maintenance and how is it accomplished ? 5
- b) What is Predictive maintenance ? What are its advantages and disadvantages ? 5
- c) List the type of wear generally observed in engineering practice. How can these be reduced ? 5
11. a) What function should a lubricant perform in different manufacturing process ? 5
- b) Explain reliability. Explain how reliability data helps in performance of maintenance. 5
- c) Discuss on the maintenance concept on major home appliances. 5
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