Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3171925 Date:16-12-2024

Subject Name: Advanced Machine Design

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	What is stress concentration? State the causes for the same.	**03**
	(b)	Explain the factors that affect endurance limit. Also explain how they are considered for design of mechanical element subjected to cyclic load.	**04**
	(c)	Discuss the Palmgren- Miner rule for life prediction for completely reversed variable amplitude loading.	**07**
Q.2	**(a)**	Explain the term wear.	**03**
	(b)	Explain in detail different types of wear experienced in mechanicalsystems.	**04**
	(c)	Give a definition for fretting, and distinguish among the related failure phenomena of fretting fatigue, fretting wear, and fretting corrosion.	**07**
		OR	
	(c)	The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5 kN. The elastic limit in bolt material is reached at 280 MPa. Determine the diameter of bolt using (a) Maximum shear stress theory (b) Distortion energy theory. Take FOS 3 on elastic limit and Poisson's ratio equal to 0.3.	**07**
Q.3	**(a)**	What are the important theories of elastic failures & explain why it is required to consider?	**03**
	(b)	Explain the factors for controlling the surface fatigue.	**04**
	(c)	Derive relationship between crack tip opening displacement (CTOD) and stress intensity factor for Mode I (KI) for small scale yielding.	**07**
		OR	
Q.3	**(a)**	Define the terms :(i)Linear Elastic Fracture Mechanics(LEFM)(ii)Elasto-hydrodynamic lubrication (iii) Hertz's Contact stress.	**03**
	(b)	Explain any two modes of the crack displacement with sketch.	**04**
	(c)	A ball thrust bearing with 7 spherical balls each of 10 mm diameter is loaded axially across its races through the balls. Races are flat. All parts are hardened steel. The axial load is 21.5 lb per ball. Calculate the size of the contact patch on a race. Assume the 7 balls share the load equally. The rotational speed is sufficiently slow that this can be considered a static loading problem.	**07**
Q.4	**(a)**	Explain the stress relaxation.	**03**
	(b)	Explain the Larson-Miller Parameters for creep deformation with diagram.	**04**
	(c)	A pin-on-disk friction testing apparatus as shown in **figure 1**involves the unlubricated rounded end of a copper pin of 80 Vickers hardness being pressed with a force of 20 N against the surface of a rotating steel disk of 210 Brinell hardness. The rubbing contact is at a radius of 16 mm; the disk rotates 80 rpm. After 2 hours the pin and disk are weighed. It is determined that adhesive wear has caused weight losses equivalent to wear volumes of 2.7mm3 and 0.65 mm3 for the copper and steel, respectively. Compute the wear coefficients.	**07**

OR

Q.4	**(a)**	Distinguish the difference between high-cycle fatigue and low-cycle fatigue	**03**
	(b)	Discuss effect of roughness, velocity and lubrication on friction.	**04**
	(c)	Explain the terms: (i) Fracture toughness (ii) Stress intensity factor (iii) Fatigue crack propagation.	**07**
Q.5	**(a)**	Enlist the factors that may affect S-N curves.	**03**
	(b)	Differentiate between Split and Non-split Mechanical housing.	**04**
	(c)	Discuss different types of materials used for Mechanical Housings.	**07**

OR

Q.5	**(a)**	Explain functions of Mechanical Housings.	**03**
	(b)	Differentiate between Noncontact and Contact Seals used in Mechanical Housing.	**04**
	(c)	Define functions of Mechanical Housing Seals. Enlist the different types of Mechanical Housing Seals.	**07**

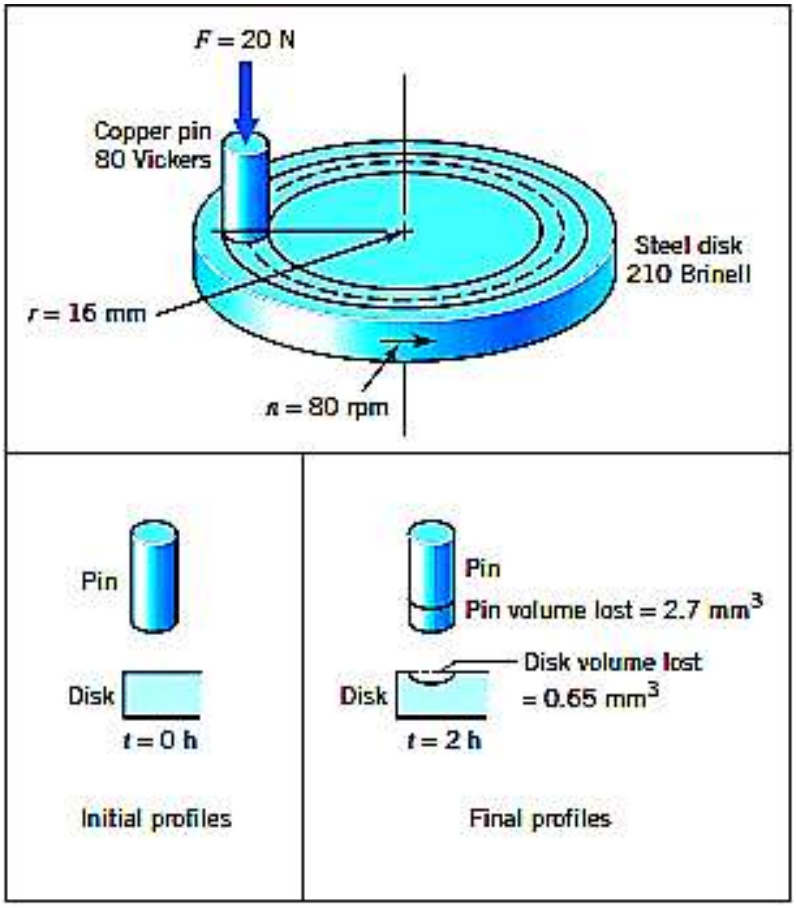

Figure : 1

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