Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – WINTER 2023

Subject Code:3171925 Date:19-12-2023

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 LEFM? State its applications.	**03**
	(b)	Explain Grifith theory and Stress intensity factor (SIF).	**04**
	(c)	(i) Explain three modes of fracture with neat sketches. (ii) Explain the terms: (a) Crack resistance (b) Stable and unstable crack growth	**07**
Q.2	**(a)**	Write the three effects of creep on life of machine element.	**03**
	(b)	Explain Sherby-Dorn and Larson-Miller creep parameters	**04**
	(c)	Explain Adhesive and abrasive wear in details and enlist design precaution to avoid Surface failure.	**07**
		OR	
	(c)	Define creep and discuss significance of creep curve in design along with its mathematical representation.	**07**
Q.3	**(a)**	Discuss the cumulative damage concept for mean zero stress with S-N diagram.	**03**
	(b)	Define: (i) Failure due to fatigue (ii) Failure due to creep	**04**
	(c)	Define fatigue life, enlist the various fatigue life methods and explain any one.	**07**
		OR	
Q.3	**(a)**	Explain the following: (i) Transient creep (ii) True stress (iii) Steady state creep.	**03**
	(b)	Discuss the various stress-time patterns with diagram	**04**
	(c)	A machine component is subjected to a flexural stress which fluctuates between + 300 MN/m^2 and – 150 MN/m^2 . Determine the value of minimum ultimate strength according to 1. Gerber relation; 2. Modified Goodman relation; and 3. Soderberg relation. Take yield strength = 0.55 Ultimate strength; Endurance strength = 0.5 Ultimate strength; and factor of safety = 2	**07**
Q.4	**(a)**	Define the terms: (i) Fracture toughness (ii) Fatigue crack propagation.	**03**
	(b)	Discuss the Strain versus Life Curve for variable load.	**04**
	(c)	Explain (1) Miner's rule for cumulative damage in fatigue. (2) The strain based approach to determine fatigue life.	**07**
		OR	
Q.4	**(a)**	Distinguish the difference between high-cycle fatigue and low-cycle fatigue	**03**
	(b)	Explain fatigue crack propagation and life estimation for variable amplitude stress.	**04**

	(c)	Explain Split housing and Non-Split housings with neat sketch.	**07**
Q.5	**(a)**	What is Mechanical Housing? Explain the importance of housing.	**03**
	(b)	What are simple Multi axial stresses and complex multi axial stresses?	**04**
	(c)	Explain fracture mechanics approach to for assessment of fatigue crack growth.	**07**

OR

Q.5	**(a)**	State the desirable properties of material for mechanical seal.	**03**
	(b)	Explain non contact seals.	**04**
	(c)	Explain SINES METHOD for assessment of fluctuating simple multiaxial stresses.	**07**

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