Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER IV (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 730902 **Date:05/05/2016**

Subject Name: Fracture Mechanics

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. Draw neat sketches wherever required to justify the answer.

Q.1	**(a)**	Explain the fracture of composite materials in detail.	**07**
	(b)	Compare the fracture mechanics methods with fatigue analysis.	**07**
Q.2	**(a)**	Explain the fracture mechanics approach and the design based on this approach. List the various applications of fracture mechanics.	**07**
	(b)	Explain the mode-I crack opening displacement by assuming Westergaard stress function.	**07**
		OR	
	(b)	An edge cracked beam carries a crack in its central plane whose (crack) length is 5 mm. A load of 1000 N is applied opposite to crack so that the crack would tend to open in bending .calculate the SIF, if the beam has the following dimensions: Depth of beam = 25 mm Thickness = 10 mm Span = 100 mm The equation for Y is, $Y = 1.93 ï 3.07(a/W) + 14.53(a/W)^2 ï 25.1(a/W)^3 + 25.8(a/W)^4$ Also value of Y corresponding to given (a/W) & S/W is 1.76	**07**
Q.3	**(a)**	Explain the fracture mechanisms - brittle fracture, ductile fracture.	**07**
	(b)	Explain the LEFM and EPFM in detail giving suitable examples.	**07**
		OR	
Q.3	**(a)**	Discuss the contributions of Griffith and Irwin in fracture mechanics area.	**07**
	(b)	Discuss Griffith's criterion for LEFM approach.	**07**
Q.4	**(a)**	Write shortnote on stress corrosion cracking (SCC).	**07**
	(b)	Explain the fracture toughness. Discuss the ASTM standard fracture test method in detail.	**07**
		OR	
Q.4	**(a)**	Derive the J- integral formula.	**07**
	(b)	Explain the three modes of crack face displacement in detail.	**07**
Q.5	**(a)**	Explain the dynamic and computational fracture in detail.	**07**
	(b)	Define stress intensity factor (SIF) and explain its importance. Explain how will you evaluate SIF associated with various geometrical configurations and loadings (explain any ONE case only)?	**07**
		OR	
Q.5	**(a)**	Discuss the characteristic growth curve of a fatigue crack with Paris law.	**07**
	(b)	Explain the damage mechanics in detail.	**07**

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