Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER III–EXAMINATION (Remedial) – WINTER 2015

Subject code: 730902 **Date: 07/12/2015**

Subject Name: Fracture Mechanics

Time: 2:30 PM to 5:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Using Airy stress function, derive the general solution of the William's asymptotic series used for computing the crack tip stress field.	**07**
	(b)	Derive the equation of stress intensity factor for Penny shaped crack.	**07**
Q.2	**(a)**	Derive the near tip stress field equations for mode-I using Westergaard approach.	**07**
	(b)	Determine the mode-I crack opening displacement by assuming Westergaard stress function.	**07**
		OR	
	(b)	Derive the near tip stress field equations for a plate with central crack and subjected to shear loading using Westergaard approach.	**07**
Q.3	**(a)**	Derive the equation for plastic zone size using Dugdale strip yield model.	**07**
	(b)	Compare Inglish and Griffith solution for a cracked body.	**07**
		OR	
Q.3	**(a)**	What is energy release rate and how it is related to potential energy for constant load and constant displacement conditions.	**07**
	(b)	Discuss crack growth resistance curves for ductile and brittle materials.	**07**
Q.4	**(a)**	Explain with neat sketch the different regions formed ahead of the crack tip during the crack growth in ductile material.	**07**
	(b)	What is the relationship between the J-integral and essential work of fracture for the case of DENT and SENT geometries?	**07**
		OR	
Q.4	**(a)**	Derive the *J*- integral formula.	**07**
	(b)	Explain essential work of fracture concept.	**07**
Q.5	**(a)**	Discuss HRR stress singularity.	
	(b)	Explain the experimental procedure for measuring the J integral from laboratory tests.	**07**
		OR	
Q.5	**(a)**	Discuss the characteristic growth curve of a fatigue crack with Paris law.	**07**
	(b)	Explain MTS criterion for crack propagation.	**07**

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