Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER –I-(New) EXAMINATION – SUMMER 2019

Subject Code: 3710909 **Date: 15/05/2019**

Subject Name: Advance Stress Analysis

Time: 02:30 PM TO 05:00 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)**	Define state of stress at a point and prove that if stress components acting in three mutually perpendicular planes passing through a point are known then stress components on any plane passing through that point can be determined.	**07**
	(b)	Explain Airy's stress function.	**07**
Q.2	**(a)**	Explain compatibility equation in two and three dimensions.	**07**
	(b)	Explain theorem of virtual work and theorem of least work.	**07**
		OR	
	(b)	A hollow circular steel column of external diameter 300 mm and internal diameter 250 mm carries an axial load of 1500 KN. Determine the compressive stress in the column. If the initial length of the column is 3.75 m. find the decrease in length of the column. Take E= $2 * 10^5$ N/mm^2.	**07**
Q.3	**(a)**	Explain different criterions for three dimensional stress analysis using plasticity.	**07**
	(b)	"The three values of principal stresses are always real and not imaginary". Comment on the degree of the validity of a given statement with a mathematical proof.	**07**
		OR	
Q.3	**(a)**	Explain evaluation of stress concentration factors in different geometries using plasticity theorem.	**07**
	(b)	Explain stress function in rectangular and cylindrical coordinate system.	**07**
Q.4	**(a)**	Explain differential equation for bending of plate to cylindrical surface	**07**
	(b)	Explain bending of circular plates loaded symmetrically w.r.t. center	**07**
		OR	
Q.4	**(a)**	Explain about circular plate with circular hole at center symmetrically loaded and load distributed along inner and outer edges.	**07**
	(b)	Explain strain rate effects on highly deformable materials and stress calculations.	
Q.5	**(a)**	Explain about stresses for two bodies in line contact with load normal to contact area and load normal and tangent to contact area	**07**
	(b)	Explain about strain gauges and types of strain gauges.	**07**
		OR	
Q.5	**(a)**	Explain Castigliano's theorem with mathematical expression.	**07**
	(b)	Explain about theory of photo-elasticity	**07**

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