Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II– EXAMINATION – WINTER - 2016

Subject Code: 2722001 **Date: 17/11/ 2016**

Subject Name: Finite Element Method in Structural Engineering

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)**	Derive the shape functions for a three-noded bar element using polynomial form in local coordinates.	**07**
	(b)	Derive the shape function of linear strain triangle with usual notations.	**07**
Q.2	**(a)**	Explain the procedure to solve the problem with Gauss Quadrature Technique with taking suitable practical example.	**07**
	(b)	Find the load vector for two-noded bar element if it is loaded with point load at centre and uniformly varying load along length.	**07**
		OR	
	(b)	Write short note on pre and post processors.	**07**
Q.3	**(a)**	Write in short "Axisymmetric solids" with respect to finite element.	**07**
	(b)	Calculate the Jacobean matrix using one point integration, for a four nodded plate element having four nodes at (0, 0), (3, 1), (3, 3) and (0, 2). All dimensions are in meters.	**07**
		OR	
Q.3	**(a)**	Explain Solid element as Tetrahedral element.	**07**
	(b)	Explain 'Hermite Polynomial'. Explain its uses.	**07**
Q.4	**(a)**	Select a suitable displacement function for a beam element and show that it satisfies the convergence criteria.	**07**
	(b)	Explain the use of finite element for the dynamic analysis in structural engineering.	**07**
		OR	
Q.4	**(a)**	Explain the principles of discretization.	**07**
	(b)	Explain the truss element and derive its shape function.	**07**
Q.5	**(a)**	Clearly distinguish between a plane stress and plane strain problem with suitable examples. Also give their strain stress linking matrices.	**07**
	(b)	Explain the types of elements used in FEM with its suitable uses.	**07**
		OR	
Q.5		A constant strain triangle element has the three nodes as (0, 0), (4, 0) and (4, 4). Calculate the Stiffness matrix for the element to be used in plane stress analysis. Assume E= 200 kN/mm^2, thickness = 18 mm and Poisson's ratio as 0.22.	**14**

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