Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME SEMESTER II EXAMINATION – SUMMER 2017

Subject Code: 2722001 **Date: 25/05/2017**

Subject Name: Finite Element Method in Structural Engineering

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)**	Determine the load vector for two-noded bar element if it is loaded with point load at one third distance from one node.	**07**
	(b)	Elaborate the procedure to solve the problem with Gauss Quadrature Technique with taking suitable practical example.	**07**
Q.2	**(a)**	Enlist the software packages which use the finite element method for structural engineering. Explain the pre processor steps.	**07**
	(b)	Calculate the Jacobean matrix using one point integration, for a four nodded plate element having four nodes at (0, 0), (2.5, 0), (2.5, 1.5) and (0, 1.5). All dimensions are in meters.	**07**
		OR	
	(b)	Write in short "Axisymmetric solids" with respect to finite element.	**07**
Q.3	**(a)**	Derive the shape functions for a three-noded bar element.	**07**
	(b)	Derive the shape function of constant strain triangle with usual notations.	**07**
		OR	
Q.3	**(a)**	Elaborate the truss element and derive its shape function.	**07**
	(b)	Clearly distinguish between a plane stress and plane strain problem with suitable examples. Also give their strain stress linking matrices.	**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 term "Isoperimetric Formulation" with suitable examples.	**07**
	(b)	Explain the term "Convergence Criteria".	**07**
Q.5	**(a)**	Write in short "Flexural vibration of Beam Element".	**07**
	(b)	Explain the principles of Discretization.	**07**
		OR	
Q.5		A constant strain triangle element has the three nodes as (0, 0), (4.5, 0) and (2.25, 4.5). Calculate the Stiffness matrix for the element to be used in plane stress analysis. Assume E= 210 kN/mm^2, thickness = 20 mm and Poisson's ratio as 0.21.	**14**

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