Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIIth SEMESTER–EXAMINATION – MAY/JUNE- 2012

Subject code: 170605 Date: 29/05/2012

Subject Name: Advanced Structural Analysis

Time: 02:30 pm – 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.**
4. **Draw neat & clean sketches with pencil only.**

Q.1	**(a)**	Explain the terms: Null Matrix, Band matrix and Transpose of a matrix.	**07**
	(b)	Derive element stiffness matrix for Constant Strain Triangle element by direct approach.	**07**
Q.2	**(a)**	Write a detail on "Process of Discretization" on finite element analysis.	**07**
	(b)	Determine the shape functions for the Constant Strain Triangle. Use polynomial functions.	**07**
		OR	
	(b)	Determine the shape functions for the Constant Strain Triangle. Use natural coordinate systems.	**07**
Q.3	**(a)**	Derive the expression of a stiffness matrix of a member of a grid structure with usual notations.	**07**
	(b)	Analyze the pin jointed truss for fig. 1 by stiffness matrix method using member approach. Adopt cross sectional area of all members = 1000 mm^2 and E = 200 kN/mm^2.	**07**
		OR	
Q.3		Analyze the frame for fig.2 by stiffness matrix method using member approach.	**14**
Q.4	**(a)**	Explain detail on "Beam with Elastic supports".	**07**
	(b)	Write a computer program on analysis of continuous beam using stiffness matrix method using C/C++.	**07**
		OR	
Q.4	**(a)**	Explain "Incremental analysis with Iteration" technique.	**07**
	(b)	Derive the shape functions for four noded quadrilateral elements.	**07**
Q.5		A propped cantilever beam of length of 10 m fixed at one end supported by a roller at the other end carries a 20 KN point load at the centre of the span. By taking e = 200 GPa and I = 24 x 10^{-6} m^4. Using finite element determine: 1. Deflaction under load 2. SF and BM at mid span 3. Reactions at supports	**14**
		OR	
Q.5	**(a)**	Determine the consistent nodal vector due to loads acting on the beam shown in fig. 3.	**07**
	(b)	Write short note on "Pre and Post Processors" on FEA packages.	**07**

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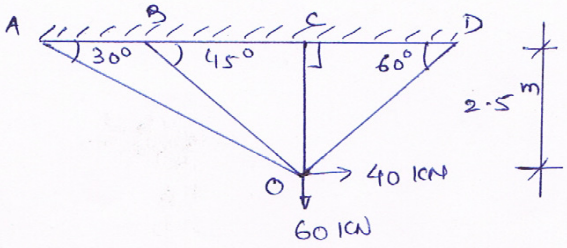

Fig. 1 (Q. 3(b))

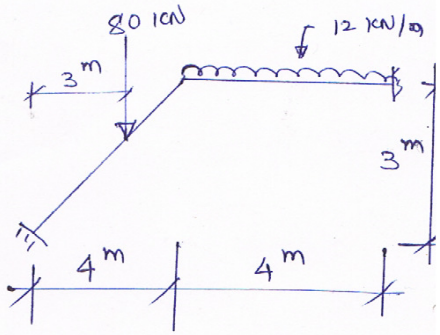

Fig. 2 (OR Q. 3)

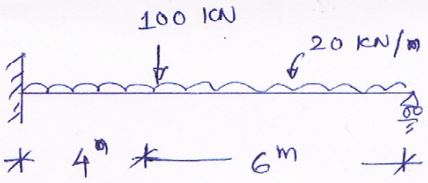

Fig. 3 (OR Q. 5(a))