Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER – VI (NEW).EXAMINATION – WINTER 2016

Subject Code: 2160609 **Date: 27/10/2016**

Subject Name: Computational Mechanics

Time: 10:30 AM to 01:30 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		**Short Questions**	**14**
	1	What is stiffness matrix?	
	2	Newton-Raphson method is used to solve for which type of problem?	
	3	What is Elastic Support in beam?	
	4	What are the boundary conditions and compatibility Condition.	
	5	State Hook's law.	
	6	What is Composite structures?	
	7	What do you mean by Axial flexural interaction?	
Q.2	**(a)**	Write the steps in detail to analyze plane truss by using Stiffness member approach.	**07**
	(b)	What are the secondary effects in stiffness method of analysis?	**07**
		OR	
	(b)	Explain the concept of symmetry & anti-symmetry giving appropriate examples	**07**
Q.3		Analyze the fixed beam shown in **fig-1** by the Stiffness Matrix method using member approach. Find the force and displacement responses. Draw S.F and B.M diagrams.	**14**
		OR	
Q.3		Analyze the plane frame using stiffness member approach shown in **fig - 2**. Support 'A' settle by 1 mm Support 'B' settle by 2 mm EI = 8 x 10^4 kN.m^2	**14**
Q.4	**(a)**	What is Finite Element Method, Explain in detail? Also discuss advantages and disadvantages.	**07**
	(b)	Determine the Shape functions for Constant Strain Triangle. Use natural Coordinate Systems	**07**
		OR	
Q.4	**(a)**	What is non linearity? Explain geometrical, material and loading non linearity giving appropriate examples	**07**
	(b)	Explain how following issues are handled in analysis (i) Sinking of support (ii) Presence of inclined support	**07**

Q.5 **(a)** Briefly explain the steps involved in finite element analysis. Discuss the assembly process in detail **07**

(b) Derive the shape function & its variation for two noded Beam element by using Generalized co-ordinate. **07**

OR

Q.5 **(a)** A bar shown in Fig. **3** has an axial load, P = 100 X 10^3 N. **07**
(i). Determine the nodal displacement.
(ii). Determine the stress in each element.
(iii). Determine the reaction Forces.

(b) Derive the Shape functions for four Noded Quadrilateral elements. **07**

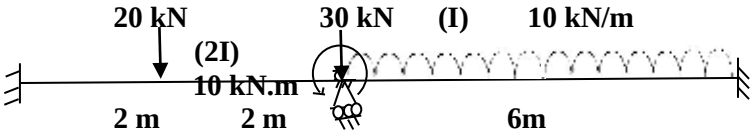

Fig. 1- Q-3

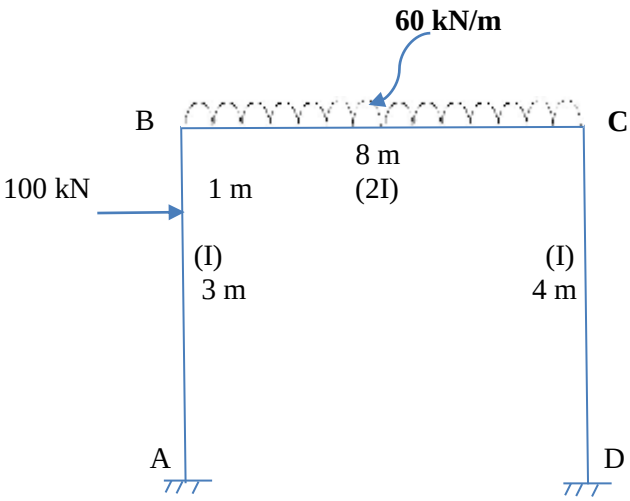

FIG-2-Q-3

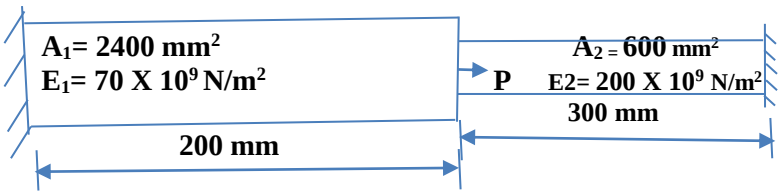

FIG- 3 -Q-5(a)