Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–VII EXAMINATION – WINTER 2015

Subject Code:X70606 **Date:04/12/2015**

Subject Name: Advanced Structural Analysis (Department elective I)

Time: 10:30pm to 1:00pm **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)**	Explain the process of discretization in finite element method.	**07**
	(b)	Derive the shape function for the constant strain triangle.	**07**
Q.2	**(a)**	Explain the concept of symmetry and antisymmetry with examples.	**07**
	(b)	Write an algorithm for the analysis of simply supported beam by stiffness matrix method.	**07**
		OR	
	(b)	Elaborate the incremental analysis with iteration technique.	**07**
Q.3	**(a)**	Analyse the continuous beam shown in figure (1) and find the assembled stiffness matrix.	**07**
	(b)	Using stiffness approach draw shear force and bending moment diagram for figure (1).	**07**
		OR	
Q.3	**(a)**	Derive the member stiffness matrix for the plane frame.	**07**
	(b)	Find the displacement and rotation at 'B' for the beam as shown in figure (2) by stiffness matrix method. EI = 10000 kN.m^2.	**07**
Q.4	**(a)**	Find the joint displacement at 'B' for the plane frame as shown in figure (3) by stiffness matrix method. I_{zz} = 1.33 x 10^{-4} m^4, A = 0.04 m^2 and E = 200 GPa. EI and EA are same for both the members.	**10**
	(b)	Explain the material and geometric non linearity with examples.	**04**
		OR	
Q.4		Analyse the truss and find the forces in the members as shown in figure (4) by stiffness matrix method. Here support 'B' settles down by 5 mm and temperature in member 'BD' increased by 10^{0}C. Adopt α = 12 x 10^{-6} ^{0}C and AE = 7000 kN. Length of member CD is 3m, AD is 4m and BD is 5m.	**14**
Q.5		Determine the joint displacement for the grid as shown in figure (5) by stiffness matrix method. The load of 100 kN is acting at the centre of member AB.	**14**
		OR	
Q.5	**(a)**	Explain the convergence requirement of the shape function.	**07**
	(b)	Using the generalized coordinate approach, find the shape function for two noded truss element.	**07**

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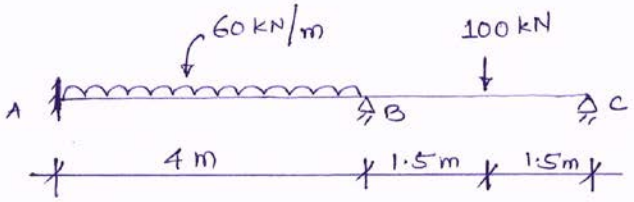

Figure 1 (Q.3(a) and (b))

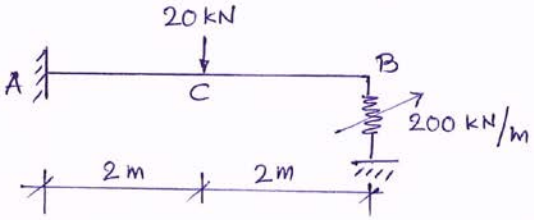

Figure 2 (OR Q.3(b))

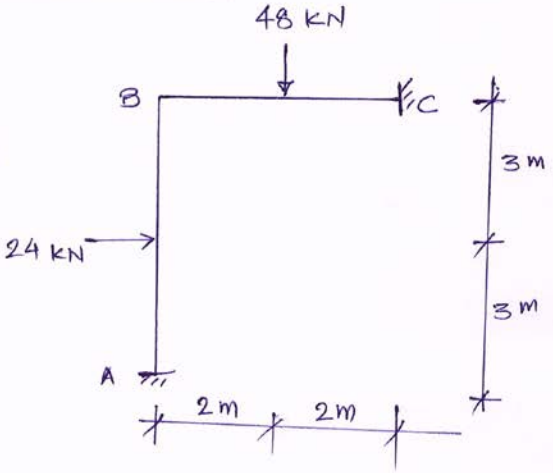

Figure 3 (Q.4(a))

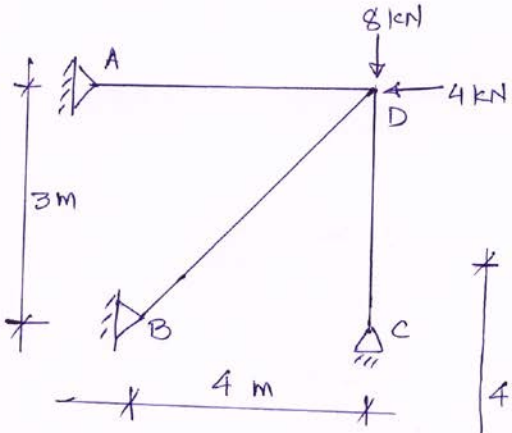

Figure 4 (Q.4)

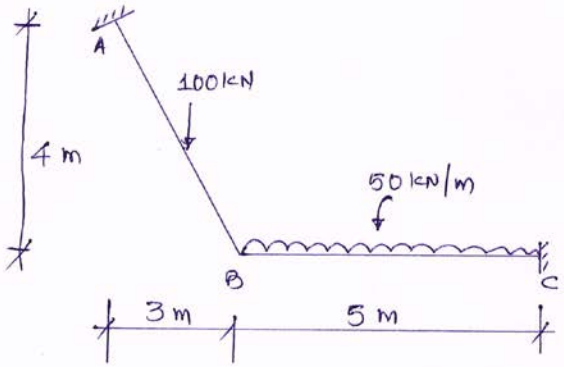

Figure 5 (Q.5)