Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Remedial Examination January/ February 2011

Subject code: 712001

Subject Name: Advanced Structural Analysis

Date: 31 /01 /2011 **Time: 02.30 pm – 05.00 pm**

Total Marks: 60

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Take Modulus of elasticity = 200 GPa and Poisson's ratio = 0.25, unless given.**

Q.1	**(a)**	For the truss shown in ***fig.-1***, determine deformations at joints using member stiffness approach.	**06**
	(b)	Determine reactions and member end actions for the truss shown in ***fig.-1***. Tabulate the forces in the member of truss.	**06**
Q.2	**(a)**	Derive the relation for action or displacement vector on member axis and structure axis for plane frame.	**06**
	(b)	For the plane frame shown in ***fig.-2***, determine load vector for member BC along structure axis using rotation transformation matrix.	**06**
		OR	
	(b)	The member CD of the plane truss as shown in ***fig.-1*** is found 3 mm shorter than its original length. Determine load vector due to this effect and due to the loading given on it. Take c/s area of the member A=400 mm^2.	**06**
Q.3		Analyse the plane frame shown in ***fig.-2*** using member stiffness approach, neglecting axial deformation condition. Use of symmetry may be permitted. Determine support reactions. Draw B.M diagram neatly.	**12**
		OR	
Q.3		Find the displacement of the composite structure shown in ***fig.-3***. Beam AB is made up of concrete (E=20 GPa) with rectangular cross section of 150 mm x 200 mm, while cable CE and DE are of steel (E=200 GPa) with 10 mm diameter.	**12**
Q.4		A symmetrical plane grid shown in ***fig.-4*** is made up of steel pipes of 300 mm outer diameter and of 8 mm thickness. Determine displacement at joints and member end actions. Draw B.M, S.F and Torsional moment diagrams. Take G=80 GPa.	**12**
		OR	
Q.4		A spring support having stiffness of 25 N/mm in vertical direction is provided at joint D of the grid shown in fig.-4. Determine displacement at joint D of the grid structure. Take remaining data from the Q.4 above.	**12**
Q.5		Analyse the plane truss shown in ***fig.-1*** using Flexibility method-member approach.	**12**
		OR	
Q.5	**(a)**	Derive stiffness matrix of a plane frame element considering axial-flexure interaction.	**06**
	(b)	Give S_M matrix, R_T matrix and S_{MS} matrix for a space truss element.	**06**

Figures

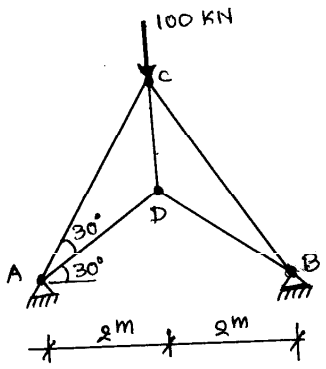

Fig. 1

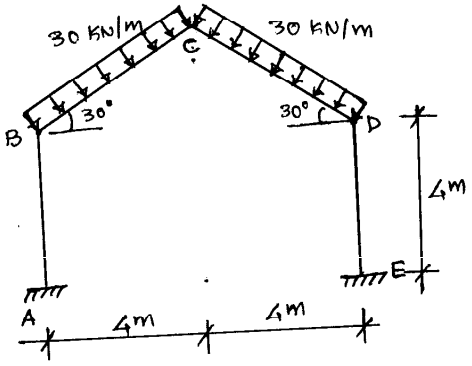

Fig. 2

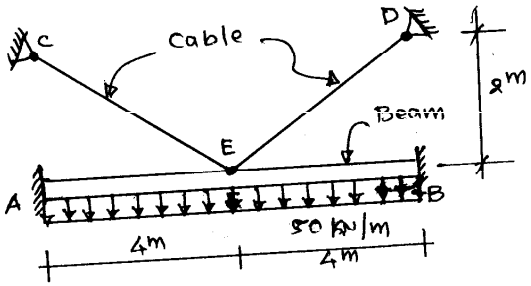

Fig. 3

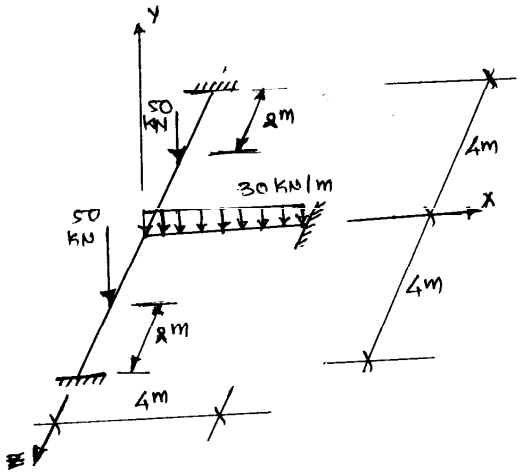

Fig. 4