

GUJARAT TECHNOLOGICAL UNIVERSITY
BE – SEMESTER-VII- EXAMINATION –SUMMER-2014

Subject Code: 170605**Date: 31-05-2014****Subject Name: Advanced Structural Analysis****Time: 02:30pm-05:00pm****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)** What is non linearity? Explain Geometrical, Material and Loading non linearity giving appropriate examples. **07**
- (b)** Enlist various steps involved in solution of problem using Finite Element Method and Explain Discretization in details. **07**
- Q.2 (a)** Determine the Shape functions for Constant Strain Triangle. Use natural Co-ordinate Systems. **07**
- (b)** Explain "Incremental Analysis with Iteration" technique. **07**
- OR**
- (b)** Derive the relation for Action or Displacement vector on member axis and Structure axis for Plane frame **07**
- Q.3** Analyse the non prismatic 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. Take $EI=80000\text{kNm}^2$. **14**
- OR**
- Q.3** Analyse the three span beam shown in **fig-2** by the Stiffness Matrix method using member approach. Draw B.M diagram. Assume constant flexural rigidity, EI. Use of Symmetry is permitted. **14**
- Q.4 (a)** Analyse the three Bar Assembly shown in **fig-3** by the Stiffness Matrix method using member approach. Find the support reaction and bar forces. Take $A=6\text{cm}^2$ for each bar. **07**
- (b)** Derive the Shape functions for four Noded Quadrilateral elements. **07**
- OR**
- Q.4 (a)** Explain "Beam with Elastic Supports" in details **04**
- (b)** Analyse the truss shown in **fig-4** by the Stiffness Matrix method using member approach. find joint displacements, support reactions, bar forces and bar elongations. Take $EA=6000\text{kN}$ for each bar **10**
- Q.5 (a)** Analyse the truss shown in **fig-5** by Stiffness Matrix method using member approach. Find support reactions, bar forces. Take $AE=60\times 10^3\text{kN}$. Use of symmetry is permitted. **07**
- (b)** Analyse the frame shown in **fig-6** by Stiffness Matrix member approach. Draw free body diagram of frame, Take $AE=8000\text{kN}, EI=20000\text{kNm}^2$ **07**
- OR**
- Q.5 (a)** Analyse the portal frame shown in **fig-7** by the Stiffness Matrix method using member approach. Consider the effect of indirect loading in the form of a settlement of 10mm at the support D. Take $E=2.5\times 10^4\text{N/mm}^2$ Find the complete force response and draw B.M diagrams. **14**

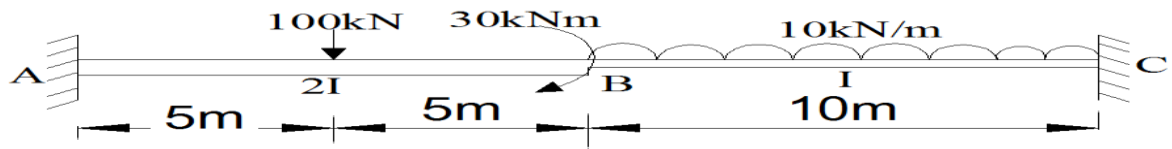


FIG-1-Q-3

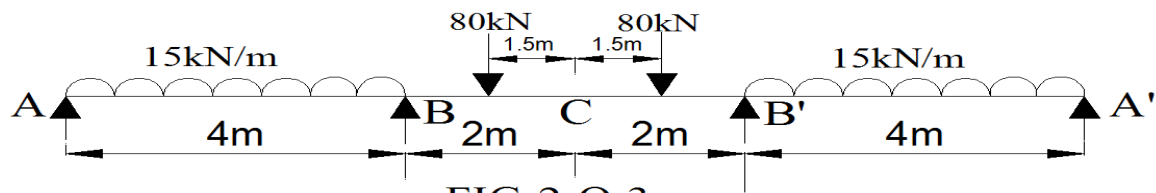


FIG-2-Q-3

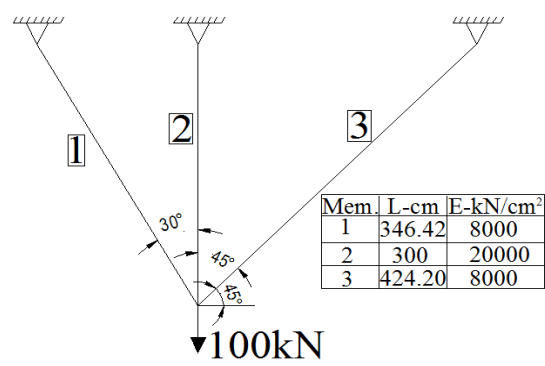


FIG-3-Q-4(a)

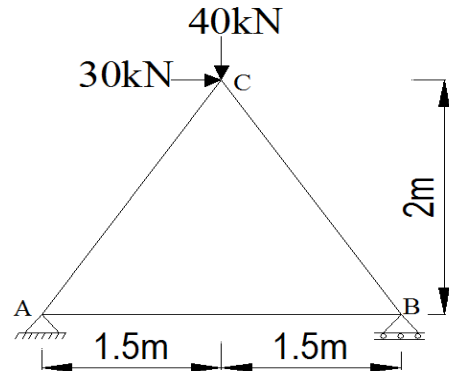


FIG-4-Q-4(b)

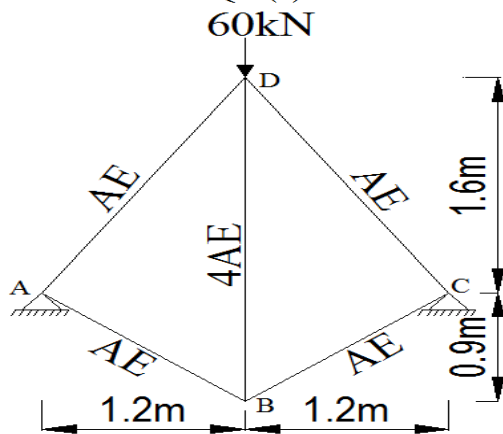


FIG-5-Q-5(a)

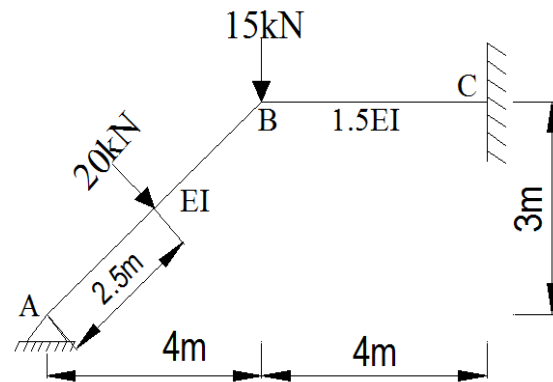


FIG-6-Q-5(b)

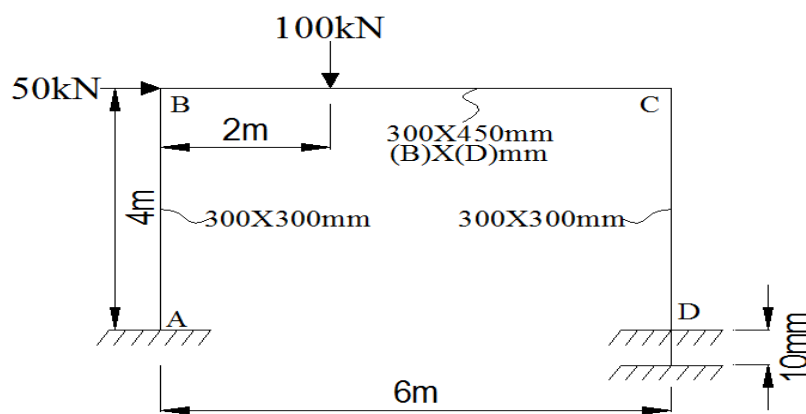


FIG-7-Q-5(a)

(PAGE 2 OF 2)