

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII • EXAMINATION – WINTER • 2014****Subject Code: 170605****Date: 29-11-2014****Subject Name: Advanced Structural Analysis****Time: 10:30 am - 01:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Take $E=2 \times 10^8 \text{ kN/m}^2$, $I= 1.5 \times 10^{-5} \text{ m}^4$, $A=0.002 \text{ m}^2$, $G=0.8 \times 10^8 \text{ kN/m}^2$ and $J=3.0 \times 10^{-5} \text{ m}^4$ if not given.

- Q.1** Analyse the beam shown in fig.1 using stiffness member approach. In addition to loading consider effect due to sinking of support at B by 4 mm. **14**
- Q.2** (a) Enlist different loading facilities available in the structural analysis professional software that you have learned. Explain assignment of floor loading facilities in detail. **07**
- (b) What is discretization? Explain how discretization is done in finite element analysis? **07**
- OR**
- (b) Determine the shape functions for the Constant Strain Triangle. **07**
- Q.3** Analyze the frame for fig.2 by stiffness matrix method using member approach. **14**
- OR**
- Q.3** (a) Find the displacements for the pin jointed truss shown in the fig.3 using stiffness member approach. Adopt cross sectional area of all members = 900 mm^2 and $E=200 \text{ kN/mm}^2$. **07**
- (b) Determine the elements of the stiffness matrix for a grid member. **07**
- Q.4** Analyze the assembly of bars shown in the fig.4 using FEM. Plot the variation of displacement, stress and strain along the length. **14**
- OR**
- Q.4** Analyse the beam shown in fig.5 using FEM. Plot SF & BM diagrams. **14**
- Q.5** (a) What is preprocessing and post-processing? Enlist different pre and post processing facilities available in the structural analysis professional software you have learned. **07**
- (b) Explain symmetry and anti-symmetry . Sketch at least one beam, one plane truss and one plane frame having symmetry and anti-symmetry. **07**
- OR**
- Q.5** Prepare an input file matrix.in to store data of $n \times n$ size S_{FF}^{-1} matrix and column vector A_{FC} . Prepare C or C++ program to read above data and containing function capable to handle the multiplication of these matrices and store result as D_F vector. Write sample input file. **14**

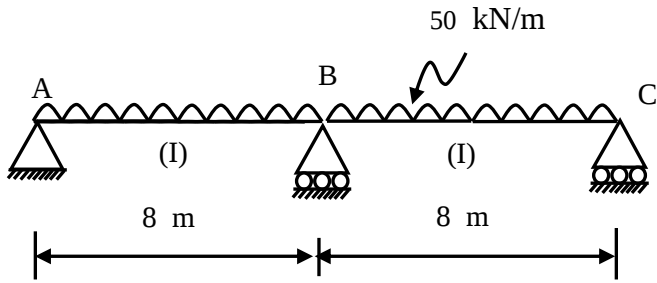


Fig.1 Q.1

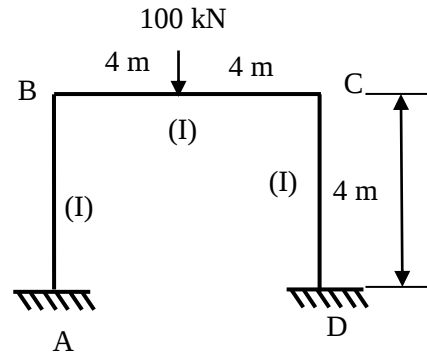


Fig.2 Q.3

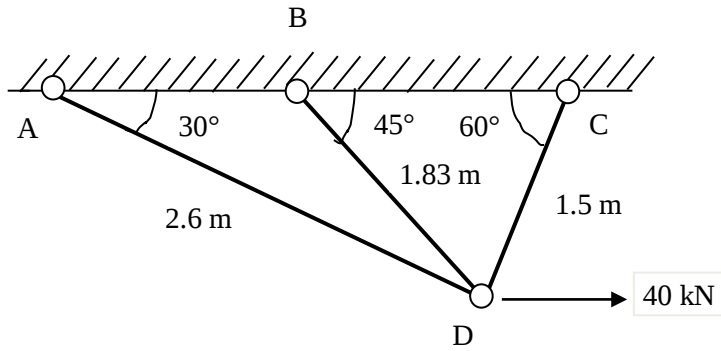


Fig.3 Q.3(a) OR

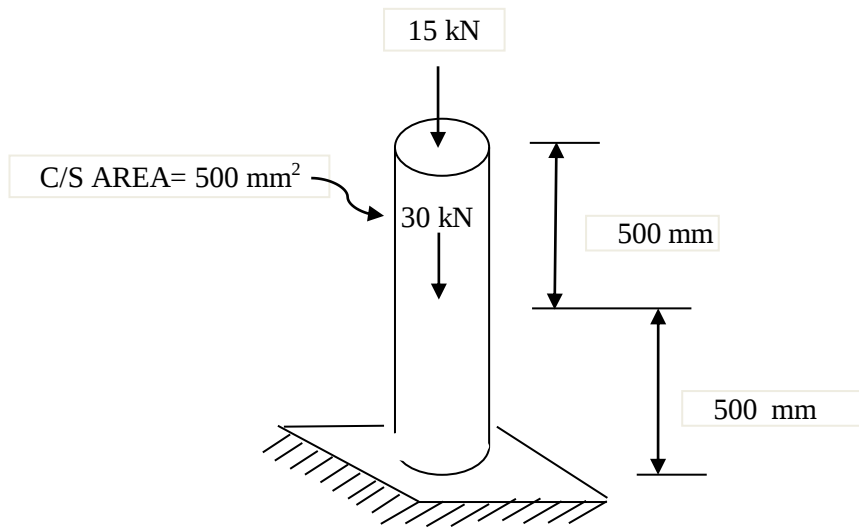


Fig.4 Q-4

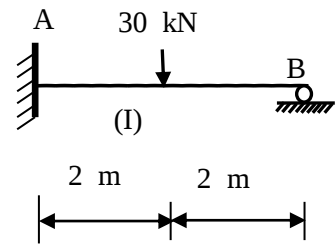


Fig.5 Q.4 OR