

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-SEM-VII EXAMINATION Nov/Dec-2011

Subject code: 170605

Date: 29/11/2011

Subject Name: Advanced Structural Analysis (EP-I)

Time: 10.30 am-1.00 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 $E=2 \times 10^8 \text{ kN/m}^2$, $I=1.5 \times 10^{-5} \text{ m}^4$, $A=0.003 \text{ m}^2$, $G=0.8 \times 10^8 \text{ kN/m}^2$ and $J=3.0 \times 10^{-5} \text{ m}^4$ if not given.

- Q-1 (a) Explain the concept of symmetry & antisymmetry giving appropriate examples. 07
(b) Enlist different loading facilities available in the structural analysis professional software that you have learned. Explain any two loading facilities in detail. 07
- Q-2 (a) Explain the concept of rotation of axes and derive relation $A_M = R_T A_S$. 07
(b) Enlist steps involved in FEM analysis and explain any two in detail. 07
- OR
- (b) What is non linearity? Explain geometrical, material and loading non linearity giving appropriate examples. 07
- Q-3 Analyse the beam shown in fig.1 using stiffness member approach and plot SF & BM diagrams. In addition to loading consider effect due to sinking of support at B by 5 mm. 14
- OR
- Q-3 Analyse a truss shown in fig.2. to find displacements and member end forces using stiffness member approach and symmetry. The values in bracket shows cross sectional area of respective member. 14
- Q-4 Analyse a plane frame as shown in the fig.3 using stiffness member approach and find displacements only. 14
- OR
- Q-4 (a) Formulate rearranged SJ matrix for the grid shown in the fig.4. 07
(b) Create an input file multiply. in to store elements of S_{FF}^{-1} matrix and load vector A_{FC} . Write a C++ OOP program capable to read stored data from input file, carry out matrix multiplication using a separate function and to store results as D_F matrix. 07
- Q-5 (a) Write an input file using appropriate commands of a Professional Software you have learned, that can handle modeling and analysis of the truss shown in the fig.2. 04
(b) For the column shown in the fig.5, determine nodal displacement and stress in each element using finite element method. 10
- OR
- Q-5 (a) Explain plane stress and plain strain problems giving example of real life structure. Give the constitution relationship for both the cases. 04
(b) Analyse the beam shown in the fig.6 to determine the slope at both the supports using FEM. 10

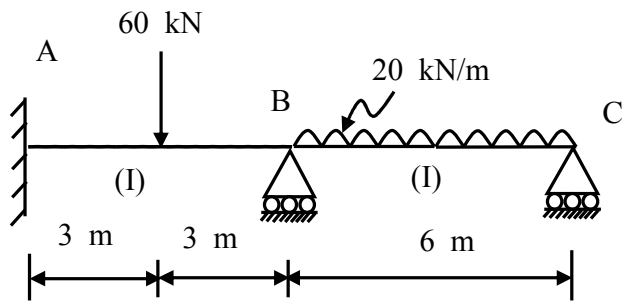


Fig.1 Q.3

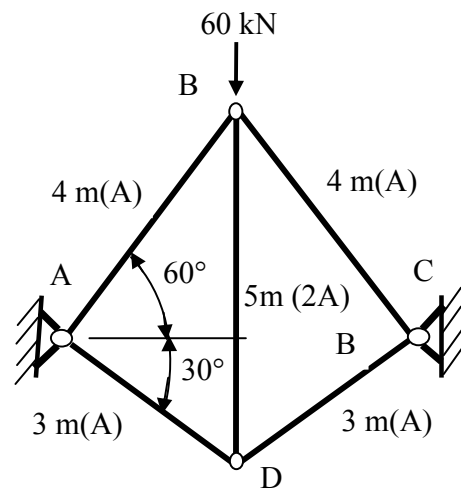


Fig.2 Q-3 OR & 5(a)

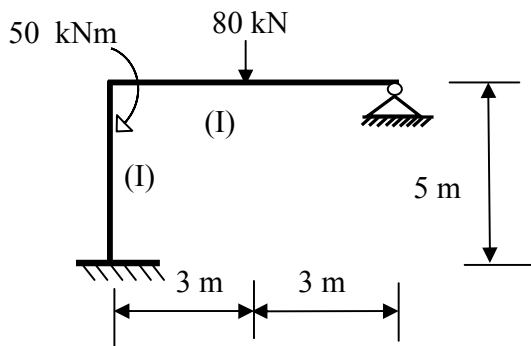


Fig.3 Q-4

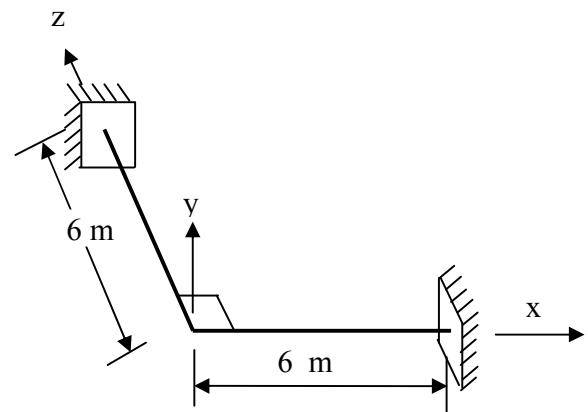


Fig.4 Q-4(a) OR

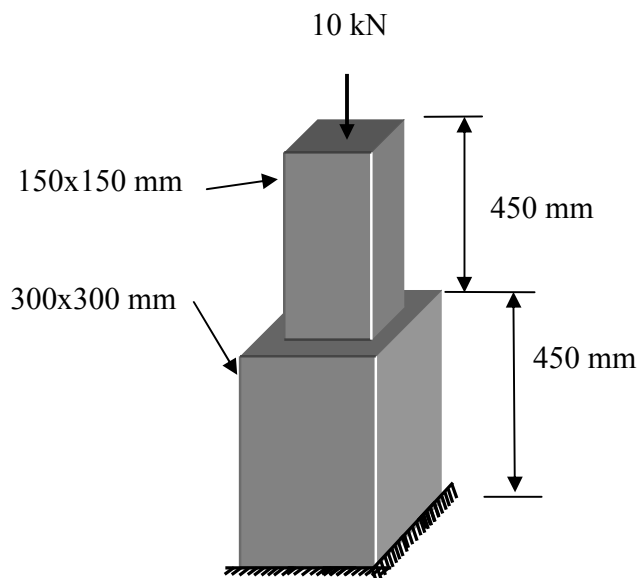


Fig.5 Q-5 (b)

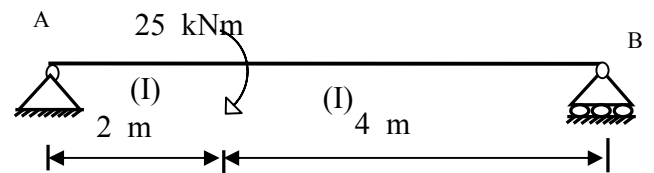


Fig.6 Q-5 (b) OR