

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-VII EXAMINATION – SUMMER 2016

Subject Code: X70606**Date: 05/05/2016****Subject Name: Advanced Structural Analysis****Time: 02:30 PM to 05:00 PM****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) Derive stiffness matrix for a plane frame with usual notations. **07**
 (b) Explain : $[S_{MS}]$, $[S_{RF}]$, $[R_T]$, $\{A_J\}$, $\{A_E\}$, $\{A_{FC}\}$, $\{A_R\}$ **07**
- Q.2** (a) Explain in brief steps of analysis of structures using finite element method. **07**
 (b) Explain use of Symmetry and Anti-symmetry in analysis of the structures with suitable examples. **07**
- OR**
- (b) Explain Material nonlinearity and Geometry nonlinearity with respect to nonlinear analysis. **07**
- Q.3** (a) Find out displacements for the beam shown in fig. 1 using stiffness member approach. **07**
 (b) Determine support reactions and member end actions for the Q-3(a) **07**
- OR**
- Q.3** (a) Find out displacements for the plane frame shown in fig. 2 using stiffness member approach. All members have the same EI & EA. Take EA = 120 EI. **07**
 (b) Find out displacements for the grid shown in fig. 3 using stiffness member approach. Take GJ = 0.8 EI. **07**
- Q.4** (a) Using symmetry of the structure, determine displacements for the plane truss shown in fig. 4. Use stiffness member approach. **07**
 (b) Using stiffness member approach, calculate displacements for the beam as shown in fig. 5, if the beam is subjected to following secondary effects:
 (i) 0.001 radian clockwise rotation of support A.
 (ii) 5 mm downward settlement of support B.
 Take EI = 20×10^3 kNm². **07**
- OR**
- Q.4** (a) Derive Stiffness Matrix for two noded bar element using finite element method. **07**
 (b) For a bar element as shown in fig. 6, calculate nodal displacements using finite element method. Consider $E = 2 \times 10^5$ MPa. **07**
- Q.5** (a) Explain plane stress and plane strain conditions giving suitable examples. **07**
 (b) Using finite element method, determine vertical displacement and rotation at node-2 of the beam shown in fig. 7. The beam is assumed to have constant EI. **07**
- OR**
- Q.5** (a) Explain any two different loading facilities in the professional software. **07**
 (b) Write a C/C++ program of input data required for the analysis of the continuous beam. **07**

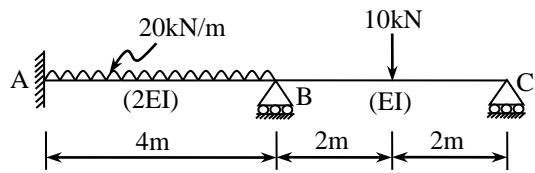


Fig. 1 Q-3(a), Q-3(b)

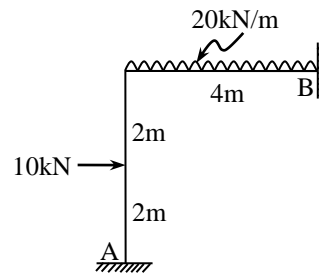


Fig. 2 Q-3(a) OR

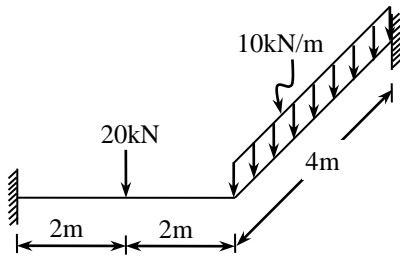


Fig. 3 Q-3(b) OR

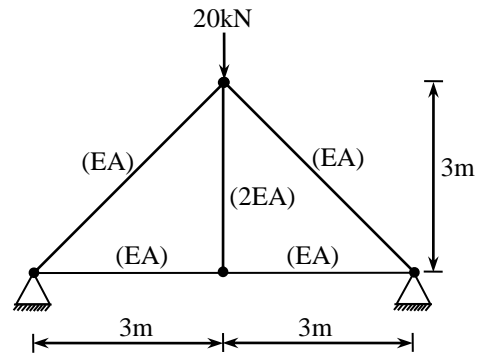


Fig. 4 Q-4(a)

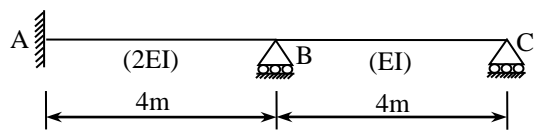


Fig. 5 Q-4(b)

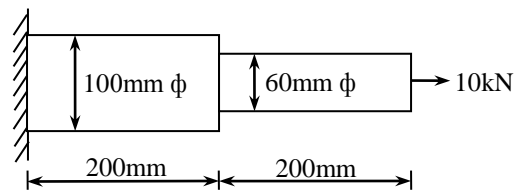


Fig. 6 Q-4(b) OR

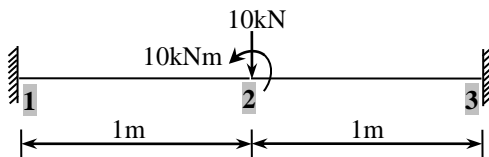


Fig. 7 Q-5(b)
