

**GUJARAT TECHNOLOGICAL UNIVERSITY****ME Semester –I Examination Feb. - 2012****Subject code: 711501N****Date: 11/02/2012****Subject Name: Matrix Analysis of Framed Structures****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  $EI = 20 \times 10^3 \text{ kN.m}^2$ ,  $GJ = 16 \times 10^3 \text{ kN.m}^2$ ,  $AE = 20 \times 10^3 \text{ kN}$  unless given.

- Q.1** (a) Derive relation between vectors  $A_{xm}$  and  $A_{xs}$  for plane truss. **07**  
 (b) Explain following matrix with illustrations. **07**  
 $[S_J], [A_{FC}], [B_{MS}], [F_M], [R_T], [S_{RF}], [A_{ML}]$
- Q.2** (a) State rotation transformation matrix for space truss and grid. **07**  
 (b) Find  $[B_{MS}]$  matrices for beam shown in fig.1 .Choose own redundant. **07**  
**OR**  
 (b) Generate  $S_m$  matrix for beam and plane truss. **07**
- Q.3** (a) Solve beam shown in fig.2 using stiffness member approach. Calculate **07**  
 displacements and reactions.  $EI = \text{constant}$   
 (b) Find the value of  $M_B$  and  $M_C$  for the beam shown in fig.3 using **07**  
 flexibility member approach.  $EI = \text{constant}$   
**OR**
- Q.3** (a) Find redundant for a plane truss shown in fig.4 using flexibility member **07**  
 approach.  $AE = \text{constant}$ .  
 (b) Calculate displacements, reactions and member end actions for above **07**  
 problem.
- Q.4** (a) Calculate displacements for the plane truss shown in fig.5 using stiffness **07**  
 member approach. All inclined members are 3 m long.  
 (b) Calculate end moments for the plane frame shown in fig.6 using any **07**  
 matrix method.  
**OR**
- Q.4** (a) What do you mean by symmetry and antisymmetry? Explain with **07**  
 suitable example.  
 (b) Calculate displacements for the grid shown in fig.7 using stiffness **07**  
 member approach.  $EI = \text{constant}$ ,  $GJ = \text{constant}$ .
- Q.5** (a) What do you understand by secondary effects? How it can be **07**  
 incorporated in analysis by stiffness member approach

(b) For beam shown in fig.8, compute displacements. If it is subjected to following effects. **07**

(i) Clockwise rotation of support A by 0.001 rad.

(ii) Downward settlement of B by 5 mm.

(iii) Member BC is subjected to temperature change of  $30^{\circ}$  at top and  $40^{\circ}$  at bottom.

Take  $EI = 20 \times 10^3$ ,

$AE = 10 \times 10^3$ ,  $\alpha = 12 \times 10^{-6}$ , depth of beam = 230 mm

**OR**

**Q.5** (a) State and explain member end actions for following case: **07**

(1) Support settlement of end

(2) Uniform temperature increase

(b) Generate load vector for plane frame shown in fig.9. **07**

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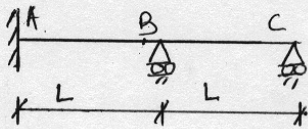


fig. 1 Q. 2 (b)

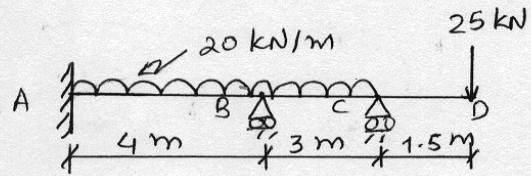


fig. 2 Q. 3 (a)

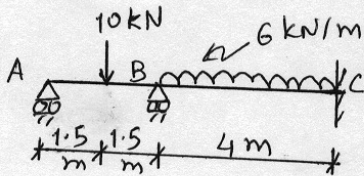


fig. 3 Q. 3 (b)

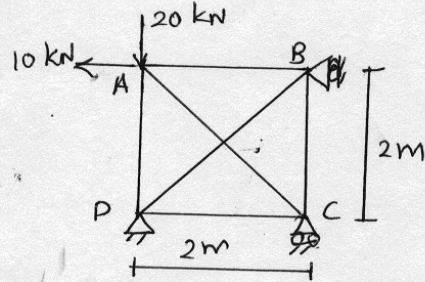


fig-4 Q. 3 (a) & (b) OR

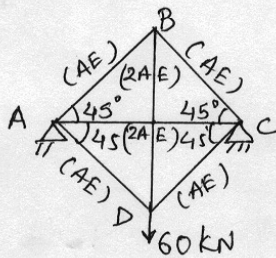


fig. 5 Q. 4 (a)

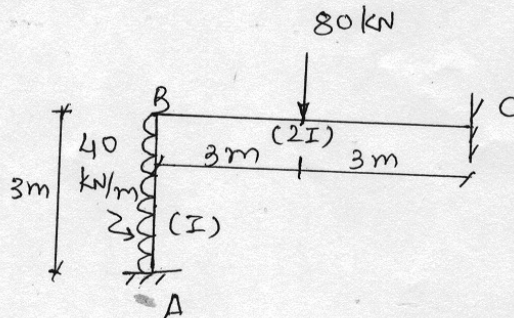


fig. 6 Q. 4 (b)

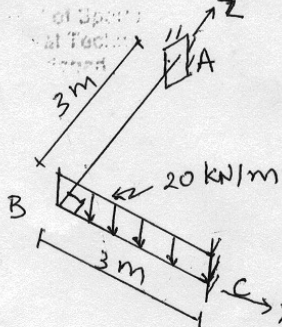


fig. 7 Q. 4 (b) OR

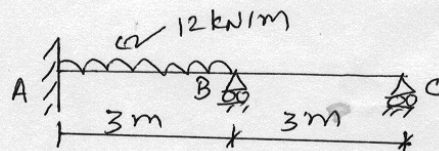


fig. 8 Q. 5 (b)

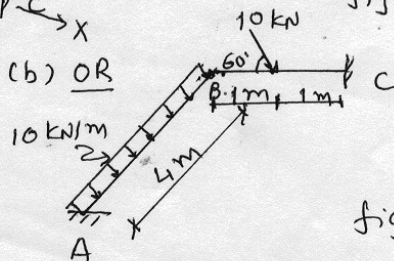


fig. 9 Q. 5 (b) OR