Hall Ticket No | | | | | | | | | | |

Question Paper Code: BST201

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - July, 2017

Regulation: IARE–R16

MATRIX METHODS OF STRUCTURAL ANALYSIS

(Structural Engineering)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Derive load vector and displacement matrix for simply supported beam subjected to w kN/m uniformly distributed load long entire span of L. **[7M]**

   (b) Explain local and global stiffness matrix for a simple truss member with example. **[7M]**

2. (a) Determine the degrees of statical and kinematic indeterminacy of the beam ABC shown in Figure 1. **[7M]**

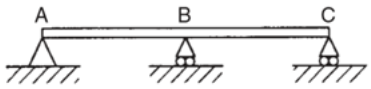

Figure 1

   (b) Determine the degrees of statical and kinematic indeterminacy of the beam ABC shown in Figure 2. **[7M]**

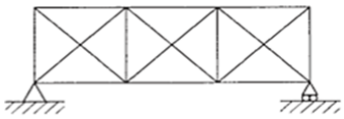

Figure 2

UNIT – II

3. (a) Analyze the axially loaded structure as shown in Figure 3. **[7M]**

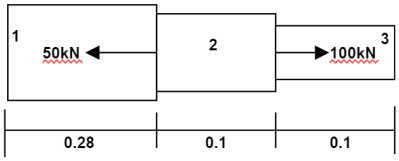

Figure 3

The individual member properties are: **[7M]**

Member	Length (m)	Area (mm^2)	Material, E (kN/mm^2)
1	0.28	400	70
2	0.1	200	100
3	0.1	70	200

Find the displacement of the connections and the forces in each member.

(b) Determine the force vector and displacement matrix for the following truss shown in Figure 4, E = 200 kN/mm^2, The reference area is A = 100 mm^2. **[7M]**

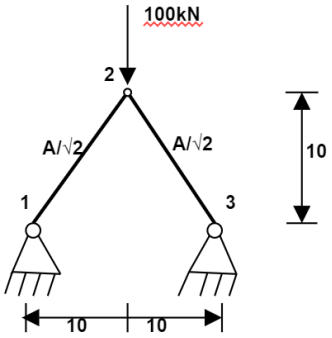

Figure 4

4. (a) Determine the force vector and displacement matrix for the following E = 200 kN /mm^2 area is A = 100 mm^2. **[7M]**

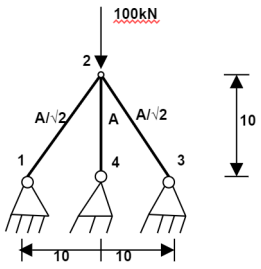

Figure 5

(b) For the following frame shown in Figure 6, determine the rotation of the joints and the bending moment diagram. Neglect axial deformation. Take EI $= 1 \times 10^5 kN - m^2$. **[7M]**

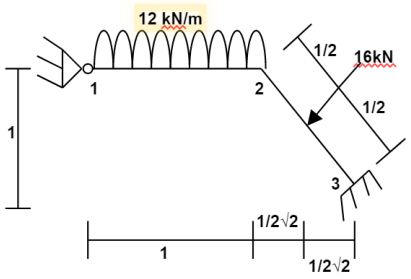

Figure 6

UNIT – III

5. Analyze the continuous beam shown Figure 7. Assume that the supports are unyielding. Assume that EI is constant for all members, using Flexibility Method. **[14M]**

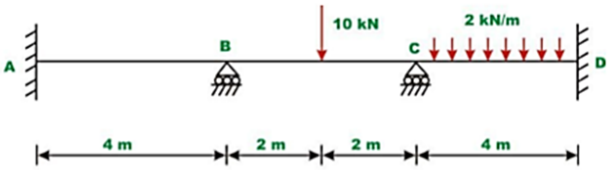

Figure 7

6. A truss of span 7.5 m carries a point load of 1 kN at joint D as shown in Figure 8 find the reactions and forces in the members of the truss, using Flexibility Method. **[14M]**

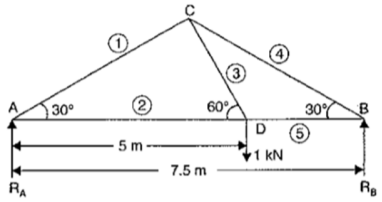

Figure 8

UNIT – IV

7. Analyze the plane frame shown in Figure 9 by direct stiffness method. Assume that the flexural rigidity for all members is the same. Neglect axial displacements. **[14M]**

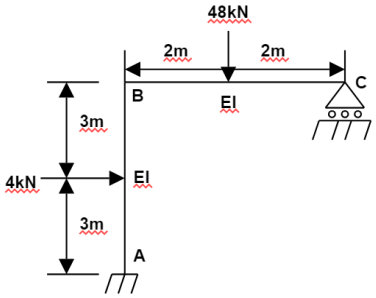

Figure 9

8. Analyze the continuous beam shown in Figure 10 assume that the supports are unyielding. Assume EI to be constant for all members using direct stiffness method. **[14M]**

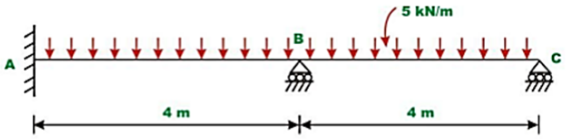

Figure 10

UNIT – V

9. (a) Write a short notes on following: **[10M]**
   i. Static condensation of stiffness matrix
   ii. Sub structuring of stiffness matrix

   (b) Summarize how stiffness matrix is also called as equilibrium method. **[4M]**

10. Analyze the truss given in Figure 11, member 13 is subject to a temperature change of 100^oC. Where $EA = 2 \times 10^4$ kN, the area of member 12 as 2A, the area of member 13 as A, and the area of member 14 as $A\sqrt{2}$. **[14M]**

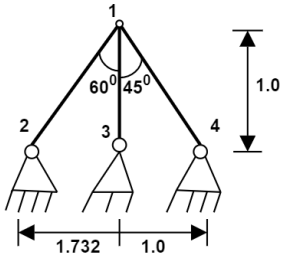

Figure 11

– ○ ○ ◯ ○ ○ –