Hall Ticket No | | | | | | | | | | | Question Paper Code: BST201

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - January, 2018

Regulation: IARE–R16

MATRIX METHOD 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) Write force displacement relation for flexibility matrix and stiffness matrix. **[7M]**
   (b) Determine the degree of statical and kinematic indeterminacy of the frame shown in Figure 1. **[7M]**

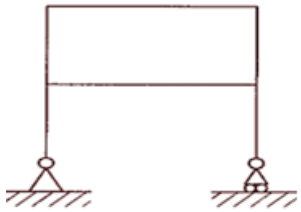

Figure 1

2. (a) Explain the local and global stiffness matrix for a cantilever beam subjected to uniform load w kN/m over entire span. **[7M]**
   (b) Derive load vector and displacement matrix for simple truss member . **[7M]**

UNIT – II

3. (a) Find the reaction of the truss shown in Figure 2 using the stiffness matrix method. **[7M]**

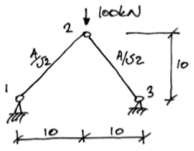

Figure 2

E = 200 kN / mm^2 ; The reference area is A = 100 mm^2

(b) Determine the bending moment diagram, the rotation of joint 2, and the horizontal displacements of joint 2 and 3 for Figure 3. Take EI = 10x10^5 kNm^2 and neglect axial deformations. **[7M]**

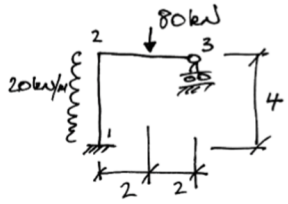

Figure 3

4. (a) Determine the bending moment diagram, the rotation of joint 2, and the vertical displacement under the 80 kN point load for Figure 4. Take EI = 10x10^5 kNm^2 and neglect axial deformations. **[7M]**

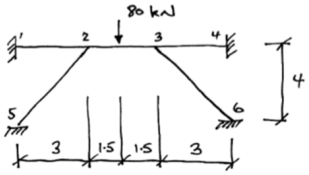

Figure 4

(b) Find the force at the member with E = 200 kN / mm^2 ; area is A = 100 mm^2; using stiffness method for Figure 5. **[7M]**

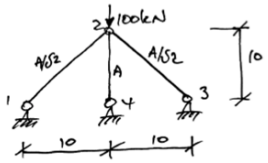

Figure 5

UNIT – III

5. (a) Analyze the continuous beam shown in Figure 6. Assume that the supports are unyielding. Assume that EI is constant for all members. **[7M]**

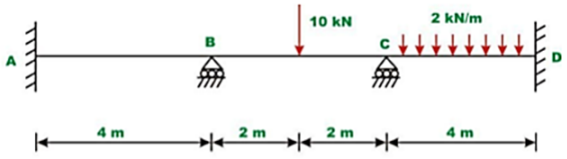

Figure 6

(b) Analyze the continuous beam shown in figure 7 using flexibility method. **[7M]**

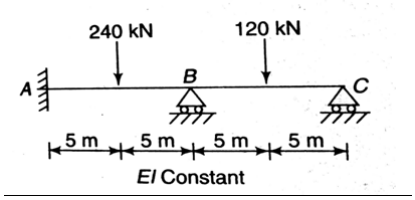

Figure 7

6. (a) A plane truss is loaded and supported as shown in Figure 8. Determine the nature and magnitude of the forces in the members' 1,2 and 3. **[7M]**

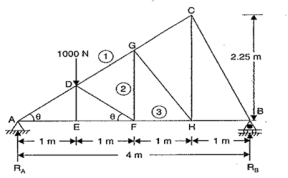

Figure 8

(b) Analyze the frame shown in Figure 9 using flexibility method. **[7M]**

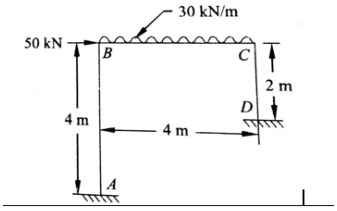

Figure 9

UNIT – IV

7. (a) Determine the forces in all the members of a cantilever truss shown in Figure 10. **[7M]**

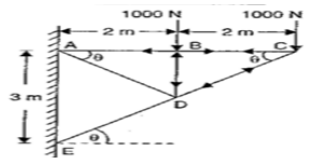

Figure 10

(b) Analyze the frame shown in Figure 11 using stiffness method. **[7M]**

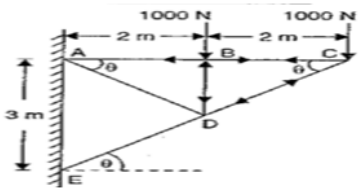

Figure 11

8. (a) Analyze the continuous beam shown in Figure 12. Assume that the supports are unyielding. Assume EI to be constant for all members **[7M]**

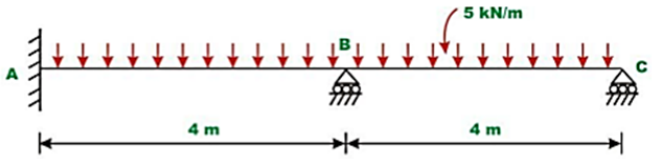

Figure 12

(b) Analyze the continuous beam shown in Figure 13 using stiffness method. **[7M]**

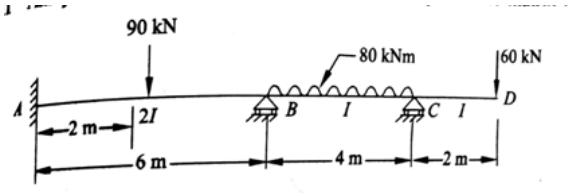

Figure 13

UNIT – V

9. (a) Write short notes on following: **[7M]**
i)Static condensation of stiffness matrix ii) Sub structuring of stiffness matrix

(b) Summarize what stiffness matrix is also called as equilibrium method

10. Explain the following special analysis procedures. **[7M]**

(a) Explain the following special analysis procedures Cholesky factorization

(b) Frontal solution of plane stress