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

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Supplementary) - May, 2019

Regulation: IARE–R16

MATRIX METHOD OF STRUCTURAL ANALYSIS

Time: 3 Hours **(STE)** **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 static and kinematic indeterminacy of the frame shown in Figure 1. **[7M]**

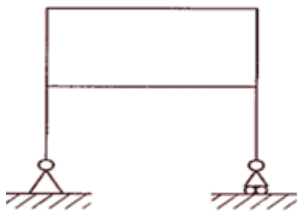

Figure 1

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) Deduce load vector and displacement matrix for simple truss member. **[7M]**

UNIT – II

3. (a) Explain the step by step procedure for flexibility matrix method. **[7M]**
   (b) Draw the bending moment diagram, the rotation of joint 2, and the horizontal displacements of joint 2 and 3 for Figure 2. Take EI = 10x10^5 kNm^2 and neglect axial deformations. **[7M]**

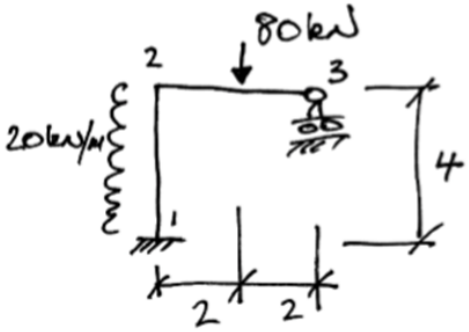

Figure 2

4. (a) Explain the assembly of global and local coordinates for formulation of transformation force and displacement matrices. **[7M]**

   (b) Find the forces in the members with E = 200 kN / mm^2 ; area A = 100 mm^2; using stiffness method for Figure 3. **[7M]**

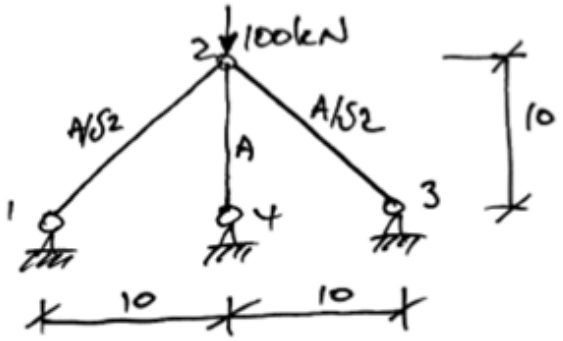

Figure 3

UNIT – III

5. (a) Define flexibility coefficient. Write the flexibility matrix for a truss and a beam element. **[7M]**

   (b) Analyze the continuous beam shown in Figure 4 using flexibility method. **[7M]**

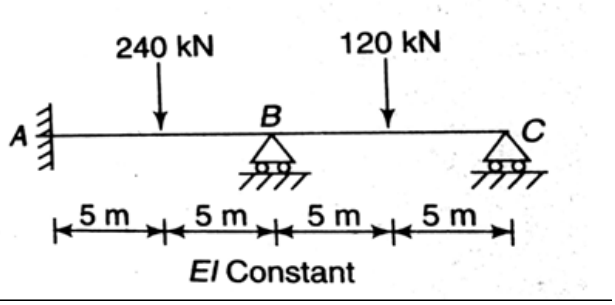

Figure 4

6. (a) Define primary structure. What is the relationship between flexibility and stiffness equations? **[7M]**

(b) Analyze the frame shown in Figure 5 using flexibility method. **[7M]**

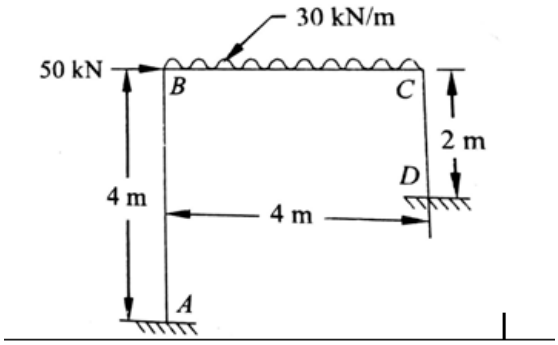

Figure 5

UNIT – IV

7. (a) Explain the approximate method for analysis of portal frames, in case of very stiff girders. **[7M]**

(b) Analyze the frame shown in Figure 6 using stiffness method. **[7M]**

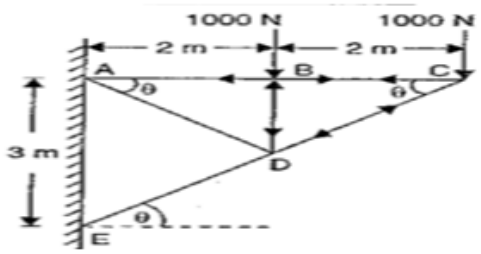

Figure 6

8. (a) Using proper DOF, write stiffness matrix equation for a member of orthogonal grid structure. **[7M]**

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

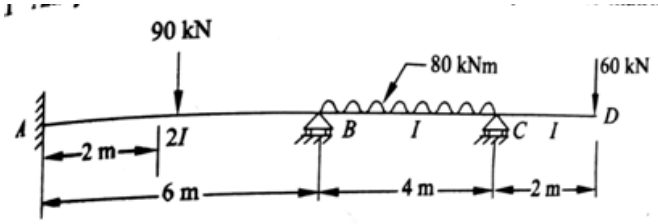

Figure 7

UNIT – V

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

(b) Summarize why stiffness matrix is also called as equilibrium method. **[7M]**

10. Explain the following special analysis procedures

(a) Cholesky factorization **[7M]**

(b) Frontal solution of plane stress **[7M]**