

**Seventh Semester B.E. Degree Examination, Jan./Feb. 2021**  
**Matrix Methods of Structural Analysis**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting at least TWO questions from each part.**

**PART - A**

- 1 a. Differentiate between :
  - i) Stiffness and Flexibility
  - ii) Equilibrium and compatibility conditions. (08 Marks)
- b. Explain principle of contragradience. (04 Marks)
- c. Develop the flexibility matrix along the given coordinate directions for the beam shown in Fig Q1 (c).



Fig Q1(c)

(08 Marks)

- 2 Analyse the continuous beam shown in Fig Q2 by flexibility method using force transformation matrix. Choose moments at A and B as redundant; Also draw Bending Moment Diagram. EI is constant

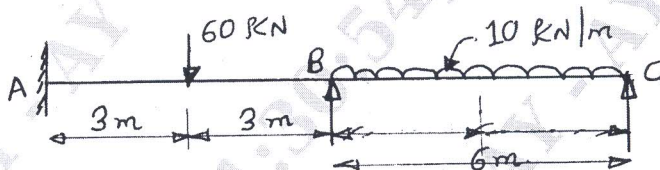


Fig Q2

(20 Marks)

- 3 Analyse the frame shown in Fig Q3 by flexibility method using Force – Transformation matrix. Take reactions at C as redundant.

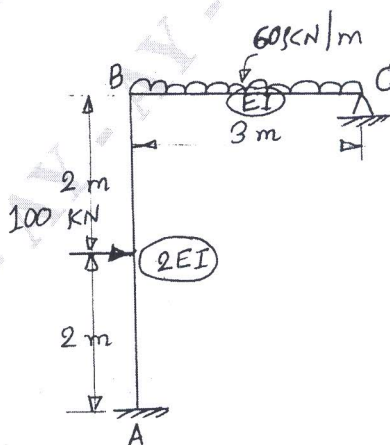


Fig Q3

(20 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

- 4 Analyse the plane truss shown in Fig Q4 by flexibility method using Force – Transformation matrix for member forces. Choose force in member BD and horizontal reaction at B as redundant. Flexibility of horizontal and vertical members are twice that of diagonal members.

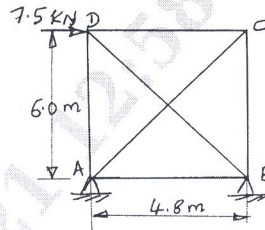
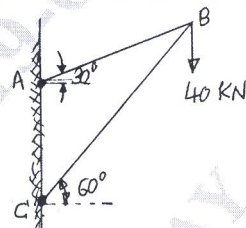


Fig Q4

(20 Marks)

**PART – B**

- 5 Find the forces in the members of the truss shown in Fig Q5 by displacement transformation method. Length of AB is 5m and BC is 8.66m. (20 Marks)



Area of AB and BC are  $3000\text{mm}^2$  and  $7000\text{mm}^2$  respectively.

Fig Q5

- 6 Using displacement transformation matrix analyse the frame shown in Fig Q6. Also draw shearing force and bending moment diagrams. (20 Marks)

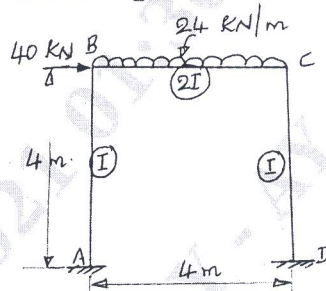


Fig Q6

- 7 a. Explain with the help of sketches: Local and Global coordinate system. (06 Marks)  
 b. Generate the stiffness matrix for a plane truss element in global directions. (14 Marks)

- 8 Analyse the continuous beam shown in Fig Q8 by direct stiffness method. Also draw bending moment and shear force Diagrams. (20 Marks)

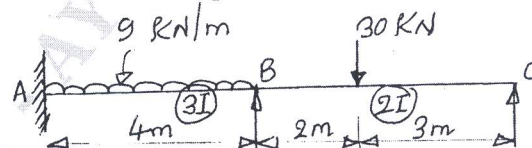


Fig Q8