CBCS SCHEME

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18CV641

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Matrix Method of Structural Analysis

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define:
i) Degree of Redundancy
ii) Degree of Freedom
iii) Flexibility
iv) Stiffness. **(10 Marks)**

b. Assemble the stiffness matrix of the beam element shown in the Fig.Q.1(b) with respect to the given co-ordinates. Refer Fig.Q.1(b). **(10 Marks)**

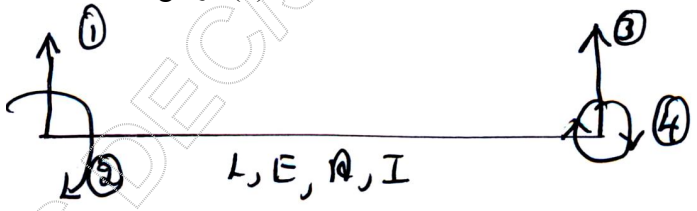
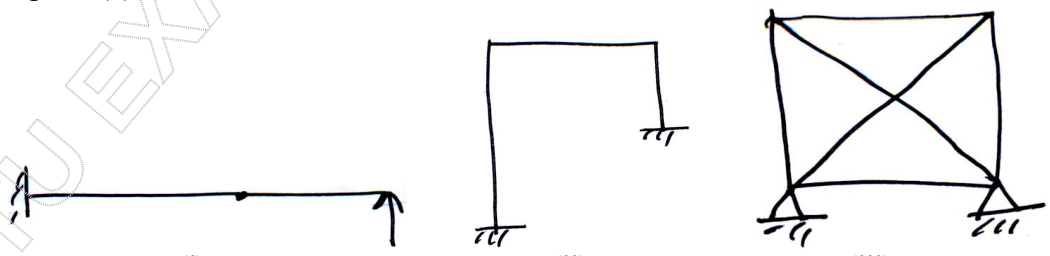


Fig.Q.1(b)

OR

2 a. Determine the degree of static and kinematic indeterminancy of the structure shown in Fig.Q.2(a). **(08 Marks)**



(i) (ii) (iii)

Fig.Q.2(a)

b. Develop the flexibility and stiffness matrices for the beam element shown in Fig.Q.2(b) with respect to given co-ordinates and show that flexibility and stiffness are inverse to each other. **(12 Marks)**

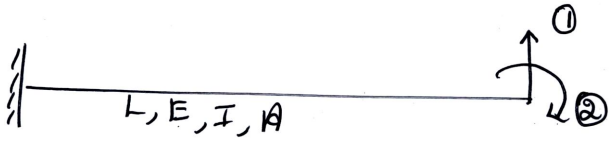


Fig.Q.2(b)

Module-2

3 Analyze the continuous beam shown in Fig.Q.3 by element flexibility matrix method. Draw BMD and elastic curve. **(20 Marks)**

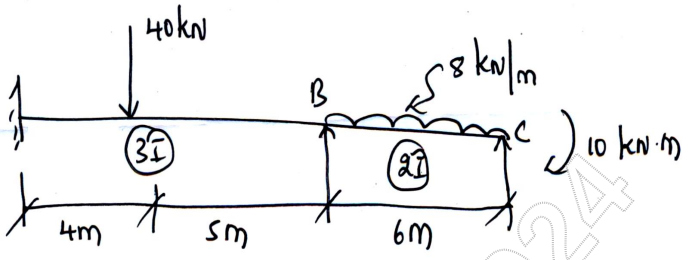


Fig.Q.3

OR

4 Analyze the rigid frame shown in Fig.Q.4 by force transformation method. **(20 Marks)**

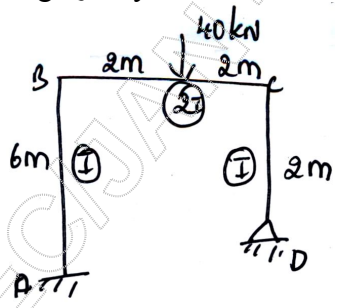


Fig.Q.4

Module-3

5 Analyze the continuous beam by displacement transformation method. Draw SFD, BMD and elastic curve. Refer Fig.Q.5. **(20 Marks)**

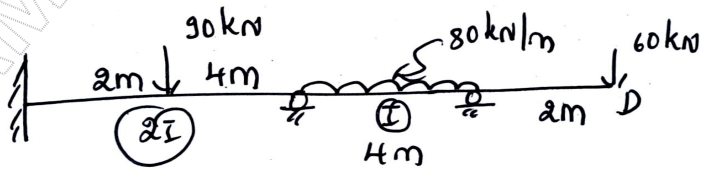


Fig.Q.5

OR

6 Determine the support moments for the rigid frame shown in the Fig.Q.6. Use element stiffness matrix method. Draw BMD and elastic curve. EI is constant. **(20 Marks)**

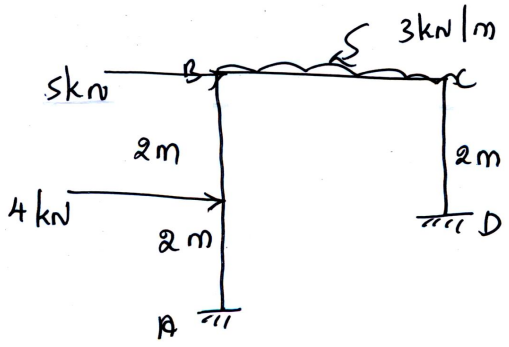


Fig.Q.6

Module-4

7 A triangular plane truss in Fig.Q.7, has cross sectional area of 3500mm^2 for all the members. The member AB was found to be 5mm shorter than the correct length at the time of assembling. Find the forces in all the members, if the member AB is forced in position. Use force transformation. Take member AB as redundant. Take E = 210GPa. **(20 Marks)**

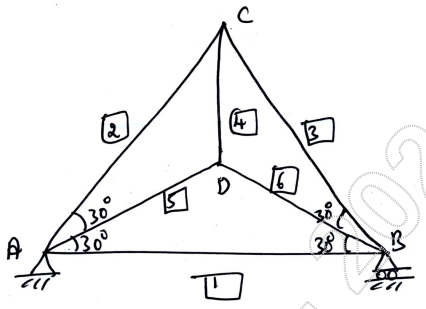


Fig.Q.7

OR

8 The top and bottom surfaces of the continuous beam in the Fig.Q.8 are heated at 20°C and 10°C respectively. Determine the final moment using element stiffness method. E = 2 × 10^{5}N/mm^2 and α = 1.2 × 10^{-5}/°C. The depth of the member AB and BC are 400mm and 200mm respectively. **(20 Marks)**

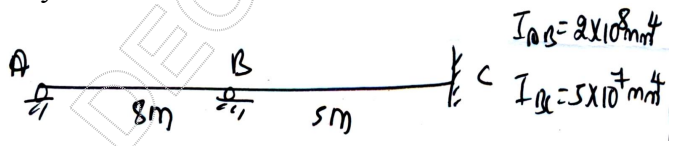


Fig.Q.8

Module-5

9 Analyze the continuous beam shown in Fig.Q.9 by direct stiffness method. Draw BMD and SFD. **(20 Marks)**

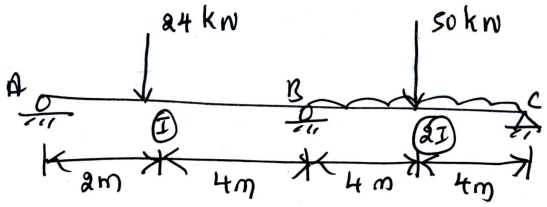


Fig.Q.9

OR

10 Determine the forces in all the members of the plane truss shown in Fig.Q.10 by direct stiffness method EI is constant. **(20 Marks)**

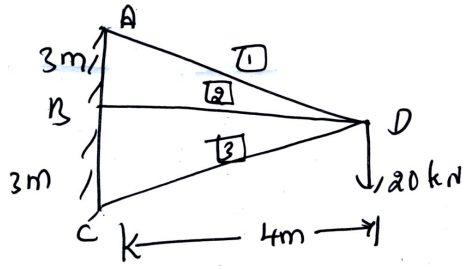


Fig.Q.10

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