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18CV641

Sixth Semester B.E. Degree Examination, July/August 2022 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. Differentiate between determinate and indeterminate structures. Define static indeterminacy and kinematic indeterminacy. Determine degree of static indeterminacy shown in Fig.Q1(a).

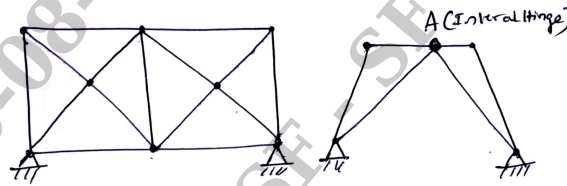


Fig.Q1(a)

(10 Marks)

- b. Show that stiffness and flexibility matrix are inverse of each other for the beam shown in Fig.Q1(b).

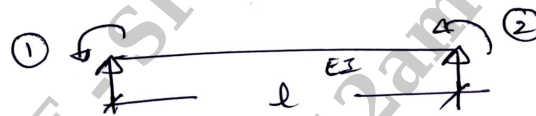


Fig.Q1(b)

(10 Marks)

OR

- 2 a. Derive the relationship between Global Flexibility Matrix (GFM) and Element Flexibility Matrix (EFM). (10 Marks)
- b. Explain the concepts of stiffness and flexibility. (10 Marks)

Module-2

- 3 a. Analyze the given beam shown in Fig.Q3(a) by force method. If the support at 'B' and 'C' sinks by $240/EI$ and $300/EI$ metre. Select moment at C and D as redundant.

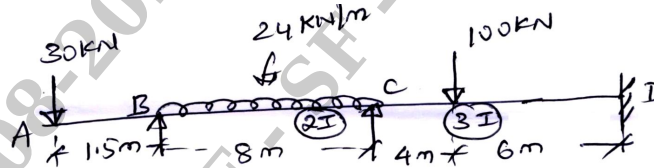


Fig.Q3(a)

(10 Marks)

- b. Analyze the frame shown in Fig.Q3(b) by flexibility method. Plot SFD, BMD and elastic curve. Select reaction at 'C' as redundant.

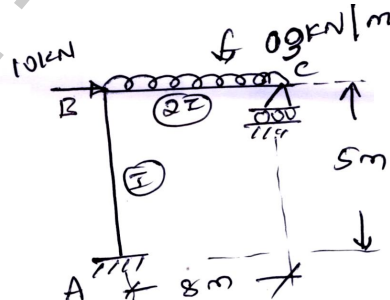


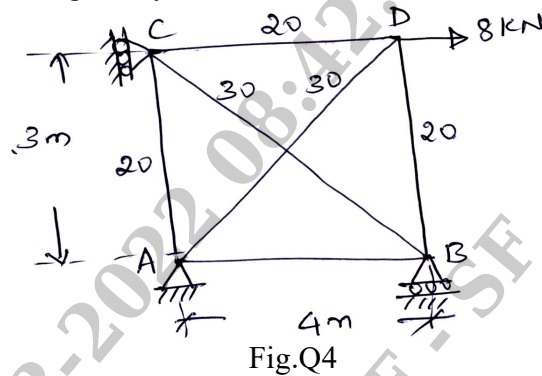
Fig.Q3(b)

(10 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.

OR

- 4 Analyze the truss shown in Fig.Q4 by force method. Area is in cm^2 .



(20 Marks)

Module-3

- 5 a. Analyze the beam shown in Fig.Q5(a) by stiffness method. Draw BWD, SFD and Elastic curve.

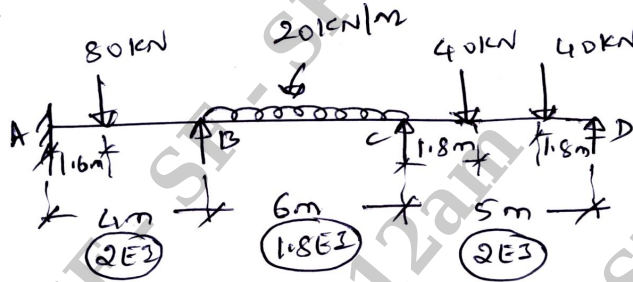


Fig.Q5(a)

(10 Marks)

- b. Analyze the given frame by element stiffness method. Plot SFD and BMD. Refer Fig.Q5(b).

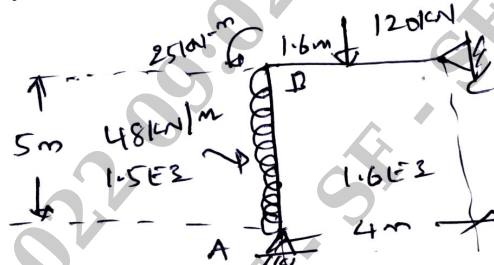


Fig.Q5(b)

(10 Marks)

OR

- 6 Find force in all members for the pin jointed frame shown in Fig.Q6 and also displacement of joint A. Use stiffness approach. Take $E = 200 \text{ GPa}$.

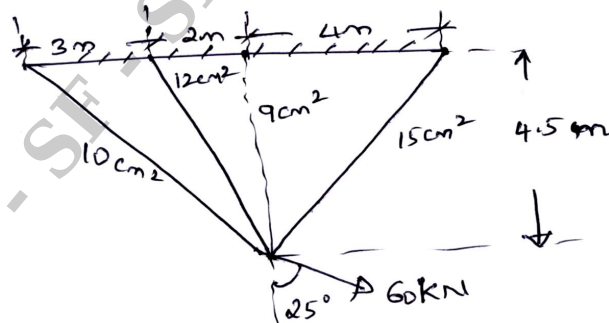


Fig.Q6

(20 Marks)

Module-4

- 7 Analyze the truss by flexibility method. Member AD is too long by 3 mm, AC is too short by 5 mm, AB is too short by 8 mm. Member AB is subjected to an increase in temperature by 25°C. AE constant for all members. Take $\alpha = 12.5 \times 10^{-6}/^{\circ}\text{C}$, $AE = 250 \times 10^3 \text{ kN}$. Refer Fig.Q7.

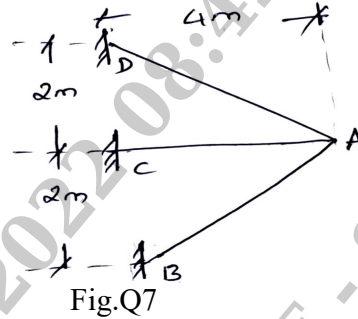


Fig.Q7

(20 Marks)

OR

- 8 In the pin jointed frame shown in Fig.Q8, all the members are cooled upto 20°C. Take $\alpha = 1.2 \times 10^{-5}/^{\circ}\text{C}$. $E = 2 \times 10^5 \text{ N/mm}^2$ for all members. Find the displacements and forces in all the members.

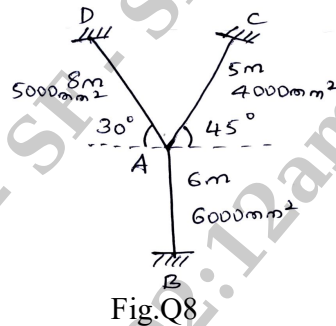


Fig.Q8

(20 Marks)

Module-5

- 9 Analyze the beam shown in Fig.Q9 by direct stiffness method.

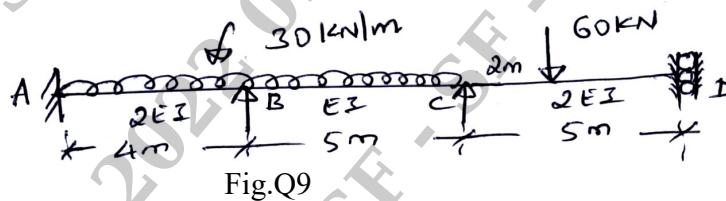


Fig.Q9

(20 Marks)

OR

- 10 Analyze the frame shown in Fig.Q10 by direct stiffness method.

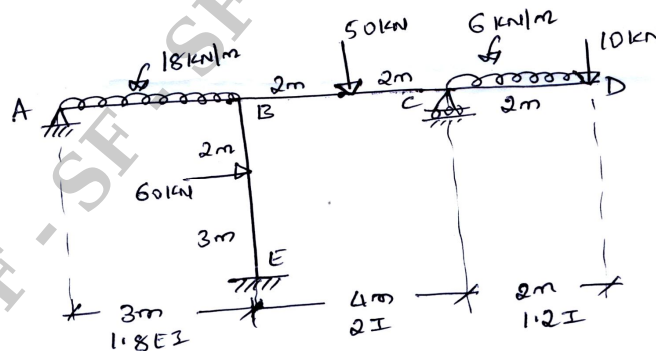


Fig.Q10

(20 Marks)
