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BTECH
(SEM V) THEORY EXAMINATION 2023-24
STRUCTURAL ANALYSIS

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

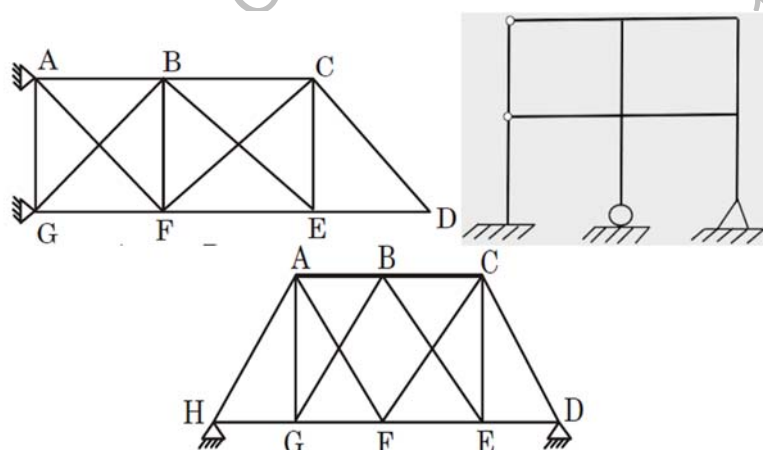
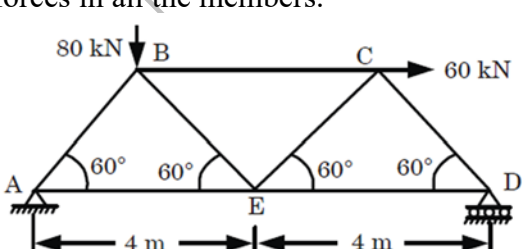
SECTION A

1. Attempt all questions in brief.

| Q no. | Question | Marks | CO |
|-------|---|-------|----|
| a. | What do you understand by the term structural load? | 2 | 1 |
| b. | Discuss the cable. | 2 | 1 |
| c. | What do you mean by compound and complex space truss? | 2 | 2 |
| d. | What are the various types of supports? | 2 | 2 |
| e. | Define the term strain energy or resilience of the member. | 2 | 3 |
| f. | Write the statement of Castigliano's first theorem. | 2 | 3 |
| g. | What do you understand by influence line? | 2 | 4 |
| h. | State Muller-Breslau's principle for determinate structure. | 2 | 4 |
| i. | What are the different types of arches? | 2 | 5 |
| j. | Define horizontal thrust. | 2 | 5 |

SECTION B

2. Attempt any three of the following:

| Q no. | Question | Marks | CO |
|-------|---|-------|----|
| a. | <p>Find the SI & KI of the following truss and frame.</p>  | 10 | 1 |
| b. | <p>Analyze the truss shown in Fig. by the method of tension coefficient and determine the forces in all the members.</p>  | 10 | 2 |
| c. | <p>State and prove the Maxwell's reciprocal theorem.</p> | 10 | 3 |



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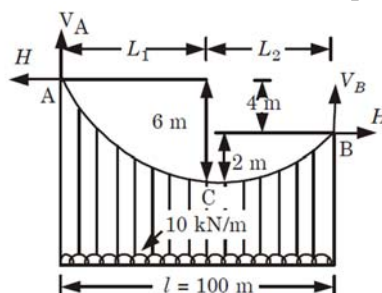
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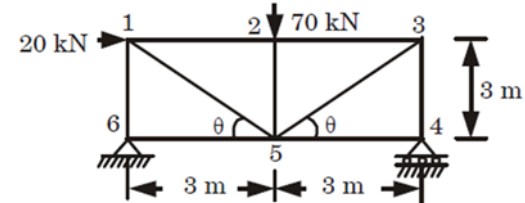
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|----|---|----|---|
| d. | A single load of 150 kN moves on a girder or span 30 m. Construct the influence line for shear force and bending moment for a section 10 m from the left support. | 10 | 4 |
| e. | A three hinged semicircular arch of radius R carries a UDL of w per run over the whole span. Find Horizontal thrust & Location and magnitude of maximum bending moment. | 10 | 5 |

SECTION C

3. Attempt any one part of the following:

| Q no. | Question | Marks | CO |
|-------|---|-------|----|
| a. | <p>A cable of uniform cross-sectional area is stretched between two supports 100 m apart with one end 4 m above the other end as shown in Fig. The cable is loaded with a UDL of 10 kN/m and the sag of cable measured from higher end is 6 m. Find the horizontal tension in the cable. Also find the maximum tension in the cable.</p>  | 10 | 1 |
| b. | Derive the expression for Length of the Cable if Both ends are at the Same level. | 10 | 1 |

4. Attempt any one part of the following:

| Q no. | Question | Marks | CO |
|-------|--|-------|----|
| a. | Explain in detail about method of substitution and method of tension coefficient with examples. | 10 | 2 |
| b. | <p>Find the forces in the members of the given truss.</p>  | 10 | 2 |

5. Attempt any one part of the following:

| Q no. | Question | Marks | CO |
|-------|--|-------|----|
| a. | Determine the vertical deflection at point C in the frame shown in Fig. Given $E = 200 \text{ kN/mm}^2$ and $I = 30 \times 106 \text{ mm}^4$. | 10 | 3 |



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| | | | |
| b. | <p>Determine the deflection and rotation at the free end of the cantilever beam shown in Fig. Use unit load method. Given $E = 2 \times 10^5 \text{ N/mm}^2$, and $I = 12 \times 10^6 \text{ mm}^4$.</p> | 10 | 3 |

6. Attempt any one part of the following:

| Q no. | Question | Marks | CO |
|-------|---|-------|----|
| a. | What are the propositions used for several point loads moving over a simply supported beam? Explain and prove propositions I. | 10 | 4 |
| b. | A Uniformly distributed load of intensity 30 kN/m crosses a simply supported beam of span 60 m from left to right. The length of UDL is 15m. Find the value of maximum bending moment for a section 20 m from left end. Find also the absolute value of maximum bending moment and shear force in the beam. | 10 | 4 |

7. Attempt any one part of the following:

| Q no. | Question | Marks | CO |
|-------|---|-------|----|
| a. | Show that the parabolic shape is a funicular shape for a three hinged arch subjected to a uniformly distributed load over its entire span. | 10 | 5 |
| b. | A three hinged parabolic arch of 60 m span and a rise of 12 m are subjected to a uniformly distributed load of 30 kN/m intensity over its left half portion and point load of 120 kN at right quarter span. Calculate the bending moment, normal thrust and radial shear at a section 15 m from the left support. | 10 | 5 |