Paper id: 250772

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM VI) THEORY EXAMINATION 2024-25
ADVANCE STRUCTURAL ANALYSIS

TIME: 3 HRS   **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data, choose suitably.
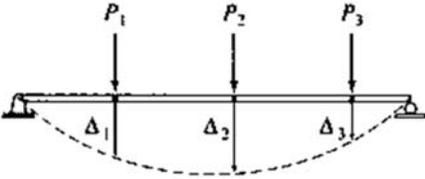
SECTION A

1.   **Attempt *all* questions in brief.**   **02 x 7 = 14**

		CO	Level
a.	Define an indeterminate structure.	1	K2
b.	Define an influence line.	1	K2
c.	Explain degree of indeterminacy.	1	K2
d.	Describe two-hinged arch.	2	K4
e.	Differentiate between two-hinged and three-hinged girders.	2	K3
f.	What is a local coordinate system in matrix analysis?	3	K4
g.	What is plastic moment capacity?	2	K2

SECTION B

2.   **Attempt any *three* of the following:**   **07 x 3 = 21**

		CO	Level
a.	Sate Castigliano's Second Theorem (Strain Energy Method) and explain how it can be applied to determine the deflection of a beam at specific locations using the example shown in the given figure. Consider the length of beam as L and concentrated loads P_1, P_2 and P_3 are working at a uniform spacing.	1	K2
b.	A suspension cable stiffened with a three-hinged girder has a span of 120 m and a central dip of 12 m. The girder carries a dead load of 0.3 kN/m. A live load of 15 kN moves from left to right. Determine: (a) the maximum bending moment anywhere in the girder; and (b) the maximum tension in the cable.	2	K4
c.	Derive expression for shape factor for a rectangular section.	2	K3
d.	Explain the fundamental principles of the Force and Displacement Methods. Compare the two methods and discuss which one is better and why.	3	K4
e.	Discuss the application of the Müller-Breslau Principle in constructing influence lines for shear force and bending moment in continuous beams.	4	K5

SECTION C

3.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

		CO	Level
a.	Determine the support reactions and draw the bending moment diagram for the	1	K2

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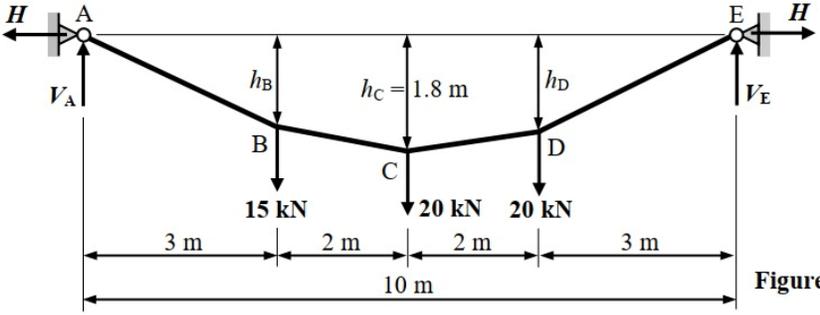**TIME: 3 HRS**   **M.MARKS: 70**

fixed beam loaded as shown below.
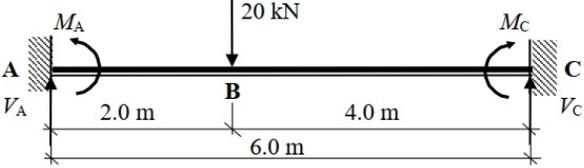
| b. | Determine the member end moments and reactions for the continuous beam shown in fig.by the slope-deflection method. | 4 | K5 |

4.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

		CO	Level
a.	Describe how the Müller-Breslau Principle helps in determining the qualitative nature of influence lines for indeterminate structures.	1	K3

b.	Given the cable structure illustrated in Figure below, with its ends A and E simply supported and subjected to three concentrated loads applied at points B, C, and D, the vertical sag at point C (h_c) is specified as 1.8 m. Neglecting the self-weight of the cable, determine the following:
	   1. The horizontal and vertical components of the support reactions at points A and E,
	   2. The vertical sags at intermediate points B and D.
	
		1	K2

5.   **Attempt any *one* part of the following:**   **07 x 1 = 07**

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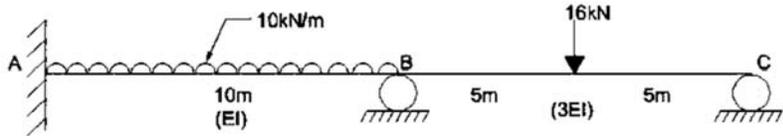
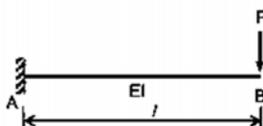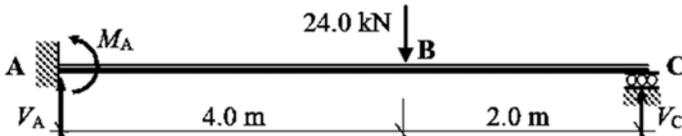|		CO	Level
a.	A suspension bridge of 240 m span has two three-hinged stiffening girders supported by two cables having a central dip of 30 m. The width of the roadway is 10 m. The roadway carries a dead load of 0.6 kN/m² extending over the entire span and a live load of 1.2 kN/m² extending over the left-hand half of the bridge. Find the bending moment (B.M.) and shear force (S.F.) at points 80 m and 180 m from the left hinge. Also, calculate the maximum tension in the cable.	1	K3
b.	Compare suspension bridges with arch bridges using suitable diagrams.	1	K3

6.   Attempt any *one* part of the following: **07 x 1 = 07**

		CO	Level
a.	Analyze the beam as shown in Figure below, using Flexibility method and draw shear force and bending moment diagram.	1	K2
b.	Find the deflection and rotation at the free end of the beam shown in Figure	2	K2

7.   Attempt any *one* part of the following: **07 x 1 = 07**

		CO	Level
a.	A propped cantilever is 6.0 m long and supports a collapse load of 24 kN as shown infigure below. Determine the required plastic moment of resistance M_{pl}.	2	K3
b.	Describe in detail the Upper Bound and Lower Bound Theorems used in the plastic analysis of structures. Explain their significance and application with suitable examples.	3	K4

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