Code No: R203201A **R20** SET - 1

III B. Tech II Semester Supplementary Examinations, December -2023
ADVANCED STRUCTURAL ANALYSIS
(Civil Engineering)

Time: 3 hours Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**
All Questions Carry Equal Marks
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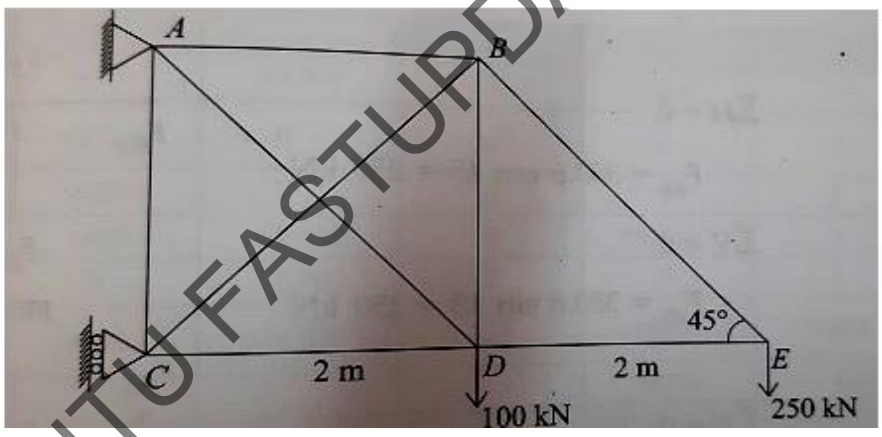
UNIT-I

1. a) Define strain energy. Derive an expression for strain energy due to bending moment. [7M]
   b) A simply supported beam of span 12 meters carrying loads of 100kN and 150kN at a distance of 4m and 3m from the left and right hands supports respectively. Calculate the deflection under 100kN load. EI= $1.4X10^5$kN-m^2. [7M]

(OR)

2. a) State castigliano's second theorem. Discuss the internal and external indeterminate structure with examples. [7M]
   b) Determine the force in the member BC of the given pin jointed truss shown in Fig. The bar BC was last to be added and was initially 1mm long, Assume the cross-sectional area of member as 1000mm^2 and E=200kN/mm^2. [7M]



UNIT-II

3. a) Differentiate between Three Hinged Arches and Two Hinged Arches. [7M]
   b) A three hinged parabolic arch rib has a span of 20m and a rise 4m to the central pin at the crown. The rib carries load of intensity 2kN/m uniformly distributed horizontally on the left 3m. Calculate the maximum and minimum bending moments. [7M]

(OR)

4. a) In a parabolic arch with two hinges how will you calculate the slope of the arch at any point? [4M]
   b) A two hinged parabolic arch of span 24m with a central rise of 4m uniformly loaded over the right half of the span with 30kN/m and a concentrated load of 100kN at the crown. Determine the horizontal thrust assuming secant variation for the moment of inertia. [10M]

UNIT-III

5. a) Write the assumptions made in portal method. [4M]

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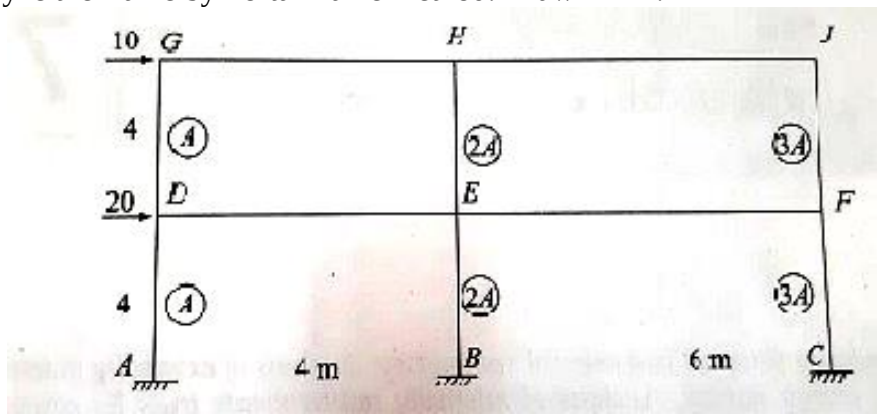
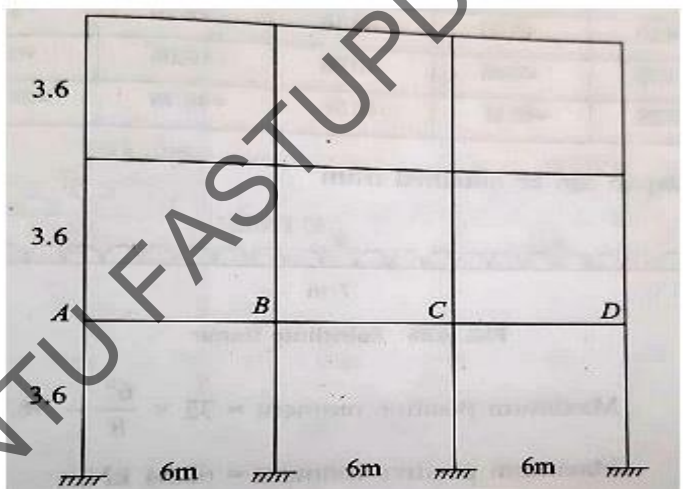
b) Analyze the frame by Portal frame method. Draw BMD. [10M]



(OR)

6. a) Write the assumptions and limitations of cantilever method. [7M]

b) Analyze the frame shown in fig by the substitute frame method. Compute the positive moment at mid span of BC. Dead load =15kN/m Live load =20kN/m. [7M]



UNIT-IV

7. a) What is the horizontal tension in a symmetrical cable of span L, the dip at the lowest point d and the supports are at the same level. [7M]

b) A light cable 24m long is supported at two ends at the same level. The supports are 20m apart. The cable supports three loads 10, 12 and 14N dividing the 20m distance in four equal parts. Find the shape of the string and the tension in various portions. [7M]

(OR)

8. a) Sketch a typical suspension cable with three hinged stiffening girder? [6M]

b) Two hinged girders of a suspension bridge have a span of 100m, the dip of the supporting cable being 10m.If the girder is subjected to two point loads of 300kN and 100kN at distances of 20m and 80m from the left end, find the S.F and B.M for the girder at 25m from the left end. Find also the maximum tension in the cable. [8M]

UNIT-V

9. a) What is sinking of supports? What is its effect on the end moments of the member? [4M]

   b) Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 4m height with I, Beam BC of span 4m, with 2I. The beam BC carries an udl of 10 kN/m. The supports at A and D are fixed. [10M]

(OR)

10. a) Mention two advantages of Kani's method over moment distribution method. [4M]

    b) A simply supported beam ABC is continuous over two spans AB and BC of 8m and 6m respectively. Span AB is carrying a uniformly distributed load of 3kN/m and span BC carries point load of 4kN at midpoint of BC. Find the support moment at B if EI of the beam is constant. Use kani's method. [10M]