Faculty of Engineering
End Sem Examination Dec-2023
CE3CO25 Structural Analysis -II

Programme: B.Tech.   Branch/Specialisation: CE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1   i.   In Kani's Method, what type of structures is it primarily used for?   **1**
           (a) Simply supported beams
           (b) Statically determinate structures
           (c) Statically indeterminate structures
           (c) Trusses and frames

     ii.   In the Column Analogy Method, which of the following structures can   **1**
           be represented as equivalent columns?
           (a) Beams and frames   (b) Trusses and arches
           (c) Simple columns only   (d) Plates and shells

     iii. In stiffness matrix method of structure analysis, the quantity taken as   **1**
           redundant is:
           (a) Deflection   (b) Rotation
           (c) Both (a) and (b)   (d) None of these

     iv.   For stable structure, one of the important properties of flexibility and   **1**
           stiffness matrices is that the element on the main diagonal-
           I.   Of a stiffness matrix must be negative
           II. Of a stiffness matrix must be positive
           III. Of a flexibility matrix must be positive
           IV. Of a flexibility matrix must be negative
           Which of the statement is correct?
           (a) I and II   (b) I and IV   (c) II and III   (d) II and IV

     v.   What is the primary purpose of the portal frame method in structural   **1**
           analysis?
           (a) To calculate support reactions   (b) To analyze portal frames
   (c) To design truss structures   (d) To calculate beam deflections

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Determine the total base shear as per IS 1893 (part1). Distribute the base shear along the height of building. Assume total load at first, second, and third storey is 3000kN, whereas at forth storey its 2500kN.
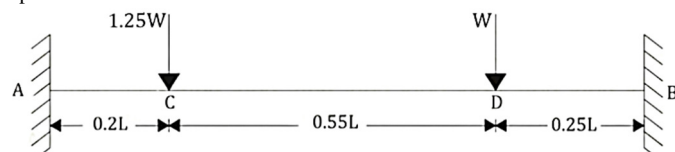
Q.5   i.   Draw the ILD for horizontal thrust and bending moment for two hinge   **3**
             parabolic arch.

     ii.   Derive the expression for horizontal thrust for two hinged parabolic   **7**
             arch subjected to UDL over its entire span. Also prove that bending moment at any point is zero.

OR   iii.   A two hinged parabolic arch of span 24m carrying a point load of 10kN   **7**
             at the centre. Calculate the horizontal thrust, bending moment, normal thrust and radial shear at 6m from left support. Also draw bending moment diagram.
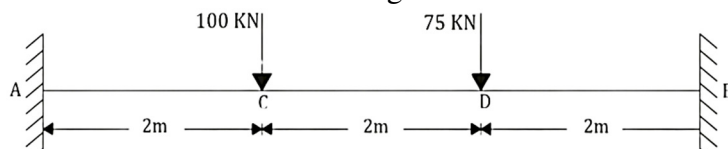
Q.6   Attempt any two:
     i.   Determine the location of plastic hinges in the fixed beam subjected to   **5**
             UDL (as shown in figure) for a distance of 'a' from the left support and make an expression for the plastic moment.
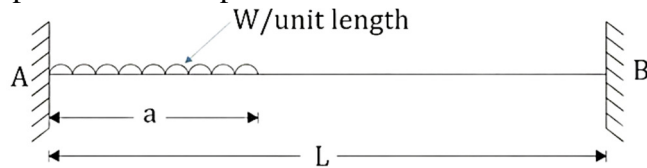
     ii.   Determine the collapse load for the fixed beam AB of span L. At point   **5**
             C, 0.2L distance from the left support A, there is a concentrated load of 1.25W and another concentrated load of W is acting at point D which is at 0.25L from the support B. The plastic moment of resistance of the beam is M_p.

     iii.   Determine the plastic moment capacity of the fixed beam as shown in   **5**
             figure. Assume uniform section throughout.

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vi. What does IS 1893 (Part1) primarily covers in the field of civil engineering? **1**
(a) Design of bridges
(b) Design of steel structures
(c) Earthquake-resistance design and construction
(d) Design of water supply system

vii. What role do the hinges in a two-hinge arch plays in its stability and flexibility? **1**
(a) They provide rigid support
(b) They allow rotation and flexibility
(c) They carry the entire load
(d) They act as decorative element

viii. Influence lines are particularly useful for analysing the effect of moving loads on which type of structures. **1**
(a) Dams   (b) Skyscrapers
(c) Bridges   (d) Tunnels

ix. In plastic analysis what is the yield point of the material? **1**
(a) The point at which the material exhibits its maximum stress
(b) The point at which material permanently deforms
(c) The point at which material fractures
(d) The point at which material becomes elastic.

x. What is the primary assumption made in plastic analysis? **1**
(a) Linear deformation of materials
(b) Elastic deformation of materials
(c) No deformation of materials
(d) Perfect plasticity of materials

Q.2 i. Write down various advantages of Kani's method. **2**

ii. Determine the final moments and reactions at the supports in the given figure by using column analogy method. Also draw bending moment diagram. **8**
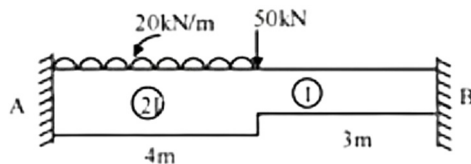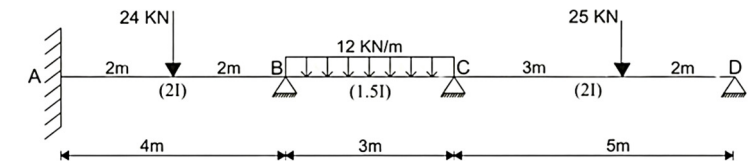

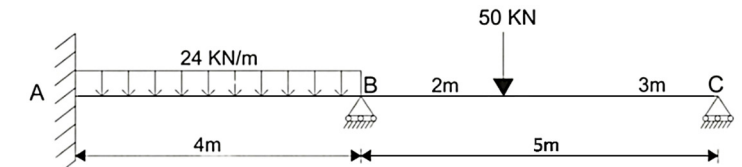OR iii. Determine the moments of the members of the given frame by using Kani's Method. **8**
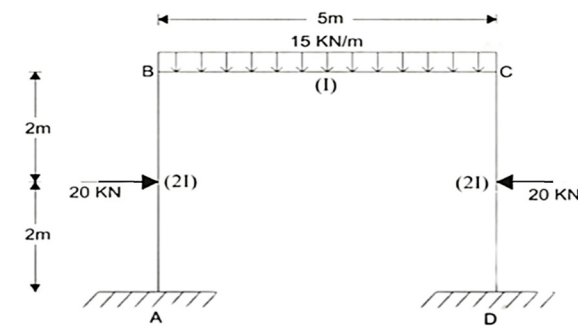
Q.3 i. What is the basic concept of matrix method in structural analysis? **2**

ii. Determine the reaction and moment at supports by stiffness matrix method. **8**

OR iii. Analyze the beam by flexibility matrix method. **8**

Q.4 i. What are approximate methods of structural analysis, and when are they typically used in engineering practice? **3**

ii. Determine the beam and column moment of the given frame by cantilever method. **7**
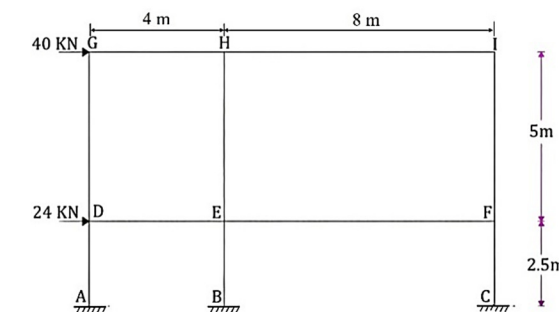
OR iii. A four storey reinforced concrete frame building is situated at Roorkee. The height between the floors is 3m & total height of the building is 12m. The dead and normal live load is lumped at respective floor. The soil below the foundation is assumed to be hard rock. Assume building is intended to be used as hospital. **7**

Q.1)
i   c
ii   a
iii   a
iv   c
v   b
vi   c
vii   b
viii   c
ix   b
x   a

Q.2) i) for each advantage of Kanis method give 1 marks

ii) for correct support reaction give 2marks, for correct
     B.M diagram give 2 marks & for correct final
     moments of beam give 4 marks.

OR iii). for correct rotation factor give 2 marks & for
     correct final moments. give 6 marks for (M_A, M_B, M_C & M_D)

Q3) i). for correct defination of matrix method give 2 marks

ii). for finding correct reaction give 4 marks & for correct
     moments give 4 marks.

OR iii) for finding flexibility coefficient give 2 marks & for
     correct moment of each ie M_A, M_B & M_C, give 2 marks each.

Q.4) i). for defining correct methods give 1.5 marks & for
     correct used in engg practise give 1.5 marks.

ii) for correct Beam moment give 3.5 marks & for
     (of each floor)
     correct column moment give 3.5 marks.

OR iii). for correct Base Shear of each storey. give 5 marks &
     for ground storey 2 marks.

Q.5) i). for ILD of horizontal thrust give 1.5 marks &
     for ILD of Bending moment give 1.5 marks.

ii). for proving B.M at any point is zero give 2 marks.
     & for correct derivation of horizontal thrust for
     two hinge arch give 5 marks.

OR iii) for Calculating horizontal thrust give 2 marks, for B.M & normal thrust give 2 marks for radial shear 1 mark, for Correct B.M diagram 1 marks.

Any two. Q.6) i) for Correct location of plastic hinge give 2 marks, for Correct plastic moment give 3 marks.

ii) for Calculating Correct Collapse load of beam.
give 5 marks.

iii). for Calculating Correct plastic moment Capacity of fixed beam give 5 marks.