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B. TECH.
(SEM-V) THEORY EXAMINATION 2020-21
STRUCTURAL ANALYSIS-II

Time: 3 Hours   *Total Marks: 100*

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

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**

   a. What is strain energy?
   b. What is meant by relative stiffness?
   c. State Muller Breslau's Principle.
   d. What is the function of arch?
   e. Two hinged arch is indeterminate. Why?
   f. Name the type of support on which the forces on anchor cable and towers depend.
   g. Distinguish between flexibility method and stiffness method.
   h. Define flexibility coefficients.
   i. What is plastic hinge?
   j. What is the main difference between plastic and elastic design?

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**

   a. Analyse the fixed beam as shown in figure and draw the B.M. and S.F. diagrams. Use strain energy method.
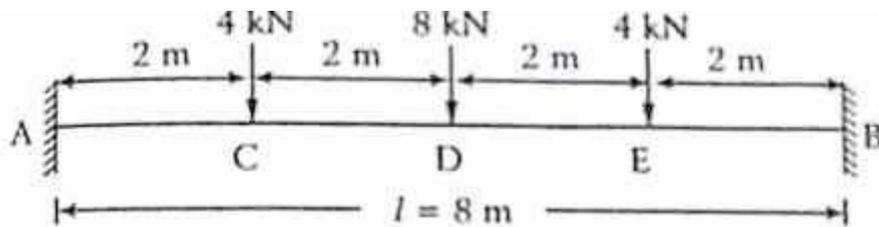
   b. Using Muller Breslau Principle, compute the influence line obtained at 2 m intervals for moment at mid span of BC of the continuous beam ABC shown in figure below:
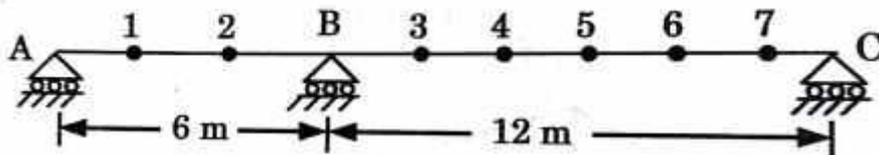
   c. A cable of span l has its heights h_1 and h_2 above the lowest point of the cable. It carries a UDL of w per unit run of the span. Determine the vertical reactions at each end.
   d. Prove that the flexibility and stiffness matrix are inverse of each other.
   e. A two span continuous beam ABC has span lengths AB = 6 m and BC = 6 m and carries a UDL of 30 KN/m on entire length of the beam. A and C are simply supports. If the load factor is 1.80 and the shape factor is 1.15 for the I – section. Find the section modulus needed. Assume yield stress for the material is 250 N/mm^2.
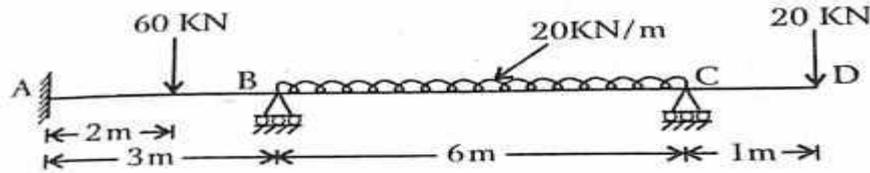
SECTION C

3. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) Analyse the continuous beam shown in figure by moment distribution method. If supports B yields by 9 mm. Take EI = 1 x 10^{12} N-mm^2 through. Draw bending moment diagram also.

(b) A beam ABCD 8.2 m long is fixed at A and is simply supported at B and C at distances 4 m and 7 m from end A with an overhang CD 1.2 m long. The span AB carries a point load of 32 KN at the mid span. A point load of 16 KN acts at the end D. Determine the moments using slope deflection method.

4. **Attempt any *one* part of the following:** 10 x 1 = 10
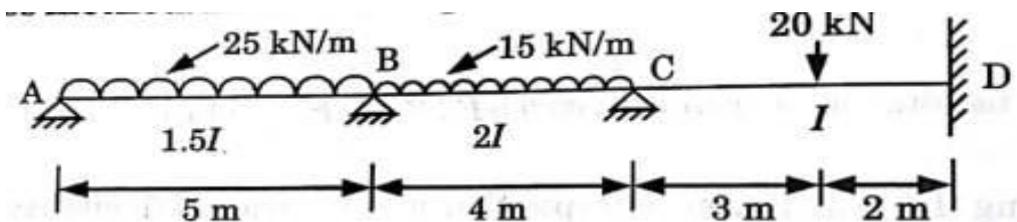
(a) A two hinged parabolic arch of span 'l' ad rise 'h' carries a concentrated load W at the crown. Find the horizontal thrust at each supports.

(b) A two hinged semi circular arch of uniform cross section has a radius of 8 m. It is subjected to a point load of 60 KN acting at a section lying in the left half span and subtended angle of 30^0 with the horizontal. Working from first principle , determine the,
  i. Horizontal thrust
  ii. Vertical reactions
  iii. Moment under the load and at crown

5. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) A chord supported at its ends 40 m apart carries loads of 20 KN, 10 KN and 12 KN at distances 10 m, 20 m and 30 m from the left end. If the point on the chord where the 10 KN load is supported is 13 m below the level of the end supports, determine the reactions at the supports, tensions in the different parts of chord and the total length of the chord.

(b) The cables of a suspension bridge have a span of 60 m and central dip of 7.5 m. Each cable is stiffened by a girder hinged at the ends and at the middle so as to retain a parabolic shape for the cables. The girder is subjected to a dead load of 10 KN/m and a live load of 20 KN/m, 15 m long. Find the maximum tension in the cable when the leading edge of the live load is just at the center of the girder. Also draw S.F. and B.M. diagrams for the girder.

6. **Attempt any *one* part of the following:** 10 x 1 = 10

(a) Analyse the continuous beam shown in figure by stiffness matrix method. Draw BMD and elastic curve.

(b) Analyze the continuous beam shown in figure by flexibility matrix method.

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7.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

(a)   Find the plastic moment required for the beam of uniform section shown in figure due to collapse load.

(b)   An I section is used as simply supported beam of span 5 m. find the shape factor of the beam section. If the beam carries a point load of 80 KN, find the load factor. Take the yield stress of I section is 250 N/mm^2.