CBCS SCHEME

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17CV42

Fourth Semester B.E. Degree Examination, July/August 2021
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. State the assumptions made in the analysis of truss. **(03 Marks)**

b. What are linear and non-linear systems? Explain. **(03 Marks)**

c. Determine the degree of static indeterminacy for the following structures [Refer Fig.Q1(c)]

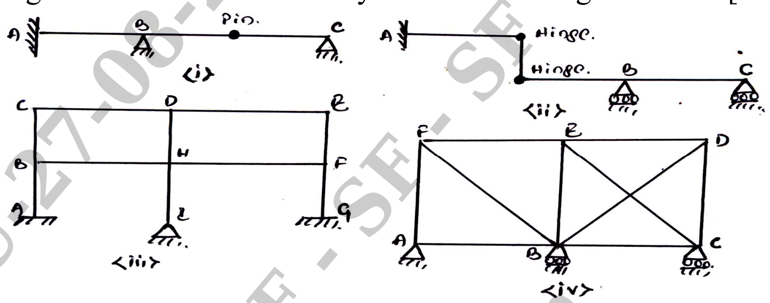

Fig.Q1(c) **(08 Marks)**

d. Analysis the forces in the members of the truss by method of joints and tabulate the forces. [Refer Fig.Q1(d)] **(06 Marks)**

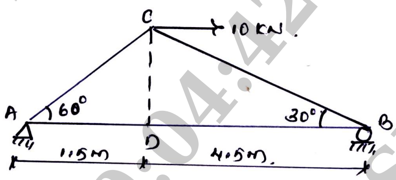

Fig.Q1(d)

2 a. Differentiate between statically determinate and indeterminate structure with examples. **(06 Marks)**

b. Determine the forces in all the members of the truss by using methods of sections and tabulate the forces. [Refer Fig.Q2(b)] **(14 Marks)**

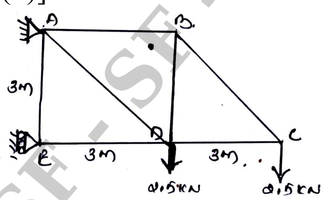

Fig.Q2(b)

3 a. Derive the moment - curvature equation for deflection. **(08 Marks)**

b. A SSB spanning 8m carries concentrated loads of 60 kN and 30 kN at a distance of 2 m and 4 m from the left support. Determine the slopes at the ends and location and magnitude of the maximum deflection. Assume E = 200 GPa and $I = 20 \times 10^8$ mm^4 (Macaulay's method). [Refer Fig.Q3(b)]

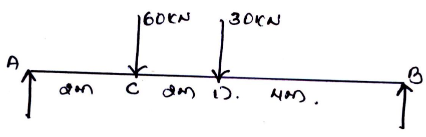

Fig.Q3(b) **(12 Marks)**

4 a. Find the maximum slope and deflection for the beam using moment area method. Take EI = 10.2×10^3 kN-m^2 [Refer Fig.Q4(a)] **(10 Marks)**

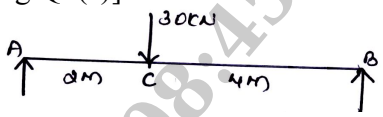

Fig.Q4(a)

b. Determine the slope at supports and deflection at mid-span of a SSB, using conjugate beam method. [Refer Fig.Q4(b)] **(10 Marks)**

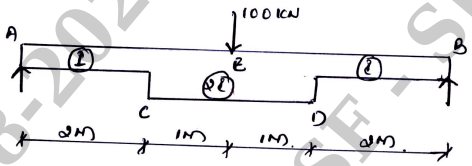

Fig.Q4(b)

5 a. Derive the expression for the strain energy stored in a beam due to flexure. **(04 Marks)**

b. Determine the deflection at the load point for the cantilever beam by using strain energy method. [Refer Fig.Q5(b)] **(08 Marks)**

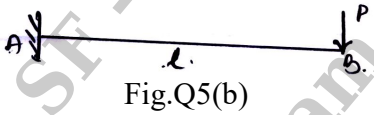

Fig.Q5(b)

c. Find the vertical deflection at 'C' for the bent using strain energy method. Take EI constant. [Refer Fig.Q5(c)] **(08 Marks)**

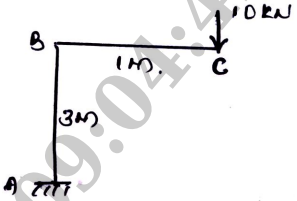

Fig.Q5(c)

6 a. Determine the deflection and slope at the free end of the cantilever beam using unit load method. Give EI = 2400 kN-m^2. [Refer Fig.Q6(a)] **(10 Marks)**

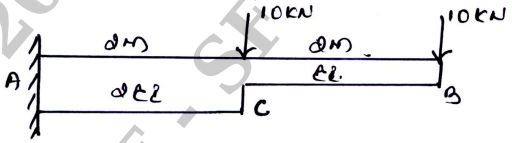

Fig.Q6(a)

b. The C/s area of each member of the truss is A = 400 mm^2 and E = 200 GPa. Determine the horizontal deflection of joint 'C' if a 4 kN force is applied to the truss at 'C'.

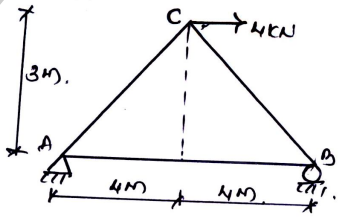

Fig.Q6(b) **(10 Marks)**

7 a. A three hinged parabolic arch hinged at the supports. A span of the arch is 24m and a central rise of 4m. It carries a concentrated load of 50 kN at 18m from the left support and a UDL of 30 kN/m over the left half portion. Determine the bending moment, normal thrust and radial shear at a section 6m from last support. **(12 Marks)**

b. A suspension table having supports at level has a span of 40m and maximum die of 4m. The cables is loaded with UDL of 10 kN/m. through its length. Calculate the maximum and minimum tension in the cable. Also find the length of the cable. **(08 Marks)**

8 a. A root-bridge 3 m wide is supported by two suspension cables with a central dip of 3m and horizontal span of 30m. Determine the maximum and minimum tension in the cable. Also determine the length of the cables and C/s area of the cable. The foot bridge has to carry a load of 10 kn/m^2. Permissible stress in the cable is 120 MPa. **(10 Marks)**

b. A light flexible cable 18m long is supported at two ends at the same level. The supports are 16mt apart. The cable is subjected to the uniformly distributed load of 10 kN/m of horizontal length over its entire span. Determine the reaction developed at the support, the tension that occurs at the support and its inclination to the horizontal. **(10 Marks)**

9 a. Determine the max. negative and max. positive shear force at point 'C' for the beam which is crossed by two connected wheel load 4m apart moving from left to right. The front wheel carries a load of 40 kN and the rear wheel 20 kN. [Refer Fig.Q9(a)]

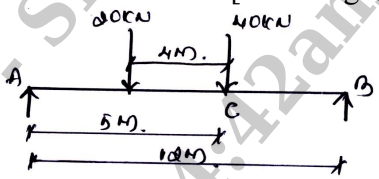

Fig.Q9(a) **(10 Marks)**

b. A moving UDL of 20 kN/m and 8 m long cross over a simply supported girder of span 20m. Determine
(i) Max. Positive and max. negative SF.
(ii) Absolute max SF and Absolute B.M. on the beam. **(10 Marks)**

10 a. Define a influence line diagram and mention its application. **(04 Marks)**

b. The multiple point loads 100 kN, 120 kN, 80 kN and 150 kN with a spacing of 2m crosses a girder of span 30m from left to right with 100 kN load leading. [Refer Fig.Q10(b)]. Calculate
(i) Reactions at the supports
(ii) Max. SF at a section 10 m from left support.
(iii) Max. B.M. at a section 10m from left support.

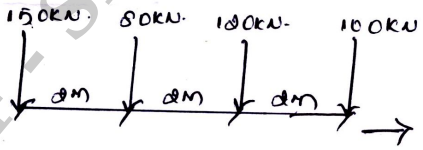

Fig.Q10(b) **(16 Marks)**

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