CBCS SCHEME

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18CV42

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Assume any missing data suitably.

Module-1

1 a. Explain with examples, statically determinate and indeterminate structures. **(08 Marks)**

b. A point load of 80 kN crosses a girder of span 15m from left to right. Calculate
i) Maximum reaction ii) Shear force and bending moment at a section 6m from left. **(08 Marks)**

c. Find the static and kinematic indeterminacy for the following structures:

Fig.Q1(c) **(04 Marks)**

OR

2 a. Define influence line diagram. What are the uses of influence diagram? **(06 Marks)**

b. Draw the unit load influence line diagram for the reactions at supports of a simply supported beam. **(04 Marks)**

c. Differentiate between degree of redundancy and degree of freedom with examples. **(10 Marks)**

Module-2

3 Determine the maximum shear force and moment at section 'C' for the beam shown in Fig.Q3. The beam is traversed by UDL of intensity 20kN/m extended over a length of 4m. Find the absolute maximum shear and maximum moment.

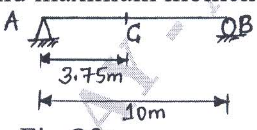

Fig.Q3 **(20 Marks)**

OR

4 a. Derive the condition for placement of load to obtain maximum bending moment at a section in a simply supported beam when a moving udl smaller than the span crosses the beam. **(10 Marks)**

b. Draw influence line diagram in members P, Q, R of the truss shown in Fig.Q4(b).

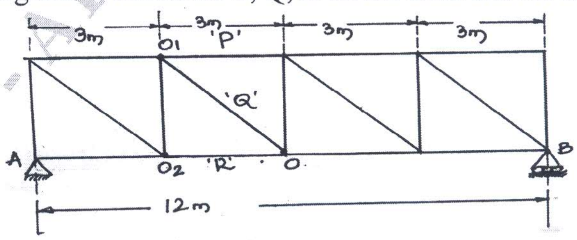

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. State and prove moment area theorems. **(10 Marks)**

b. Find the slope at the support and deflection under the point load, as shown in Fig Q5(b) by using conjugate beam method.

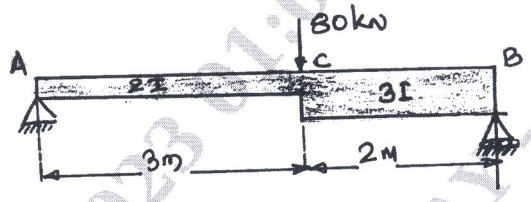

Fig.Q5(b) **(10 Marks)**

OR

6 a. Find the maximum slope and maximum deflection for the loaded beam shown in Fig.Q6(a) by moment area method.

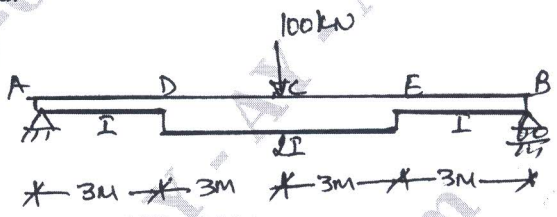

Fig.Q6(a) **(10 Marks)**

b. Using conjugate beam method, find the deflection at point 'C' and slope at 'A' for the simply supported beam shown in Fig.Q6(b).

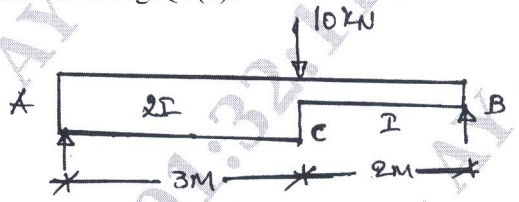

Fig.Q6(b) **(10 Marks)**

Module-4

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

b. Find the deflection at the free end of the cantilever beam by strain energy method. Take EI as constant. [Refer Fig.Q7(b)]

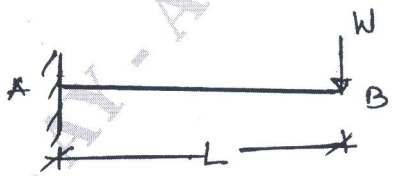

Fig.Q7(b) **(06 Marks)**

c. Determine the vertical deflection and rotation at the free end for the cantilever beam at free end for the Fig.Q7(c) shown by unit load method. Take $E = 2\times10^5$ N/mm^2 ; $I = 12\times10^6$ mm^4.

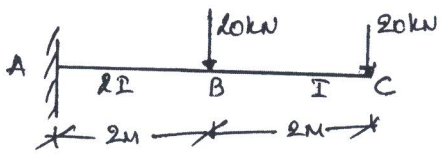

Fig.Q7(c) **(10 Marks)**

OR

8 a. Using Castigliano's theorem, determine the vertical and horizontal deflection at free end of a bracket shown in Fig.Q8(a).

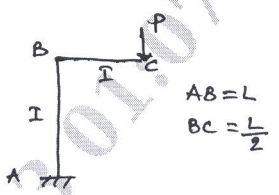

Fig.Q8(a) **(10 Marks)**

b. Determine the maximum deflection for a simply supported beam subjected to central concentrated load 'W' using unit load unit load method. [Refer Fig.Q8(b)]

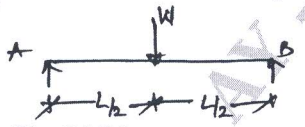

Fig.Q8(b) **(10 Marks)**

Module-5

9 a. A three hinged parabolic arch of 20m symmetrical span and 5m rise, carries a udl of 40 kN/m on the entire span and a point load of 200 kN at 5 m from right end. Determine the reactions. Also determine Bending Moment, Normal thrust and radial shear at 5m from left end. **(10 Marks)**

b. A cable of uniform cross-section is suspended between two supports of 100m span. It carries a udl of 10 kN/m spread over the horizontal span. The lowest point of the cable sags 10m below the supports. Find
i) Maximum and minimum tension in the cable and its inclination.
ii) Minimum required c/s area of the cable, if the allowable stress is 280 MPa.
iii) Length of the cable. **(10 Marks)**

OR

10 a. Show that, a suspension cable hangs in the form of a parabola when it carries a udl over the entire span and had supports at same level. Also write down the expression for maximum and minimum tension in the cable. **(10 Marks)**

b. The three hinged parabolic arch of span 60m is loaded as shown in Fig.Q10(b). Find the bending moment at point 'P' which is located at 20m from the left support.

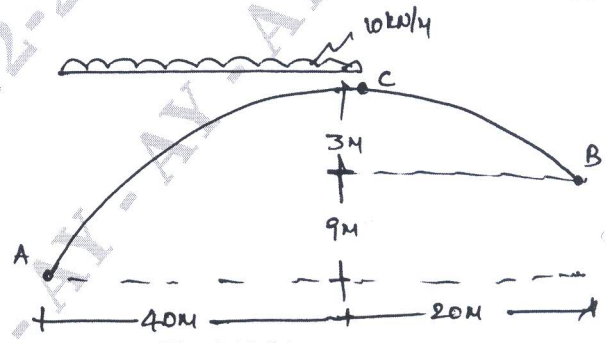

Fig.Q10(b) **(10 Marks)**

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