CBCS SCHEME

USN | | | | | | | | | | |

18CV42

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Analysis of Determinate Structures

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Distinguish between Static and Kinematic indeterminate structures, with examples. **(06 Marks)**

b. Define the following :
(i) Linear and non-linear systems
(ii) Geometric and material non-linearity **(06 Marks)**

c. Determine the static and kinematic indeterminacy for the structure shown in Fig.Q1(c).

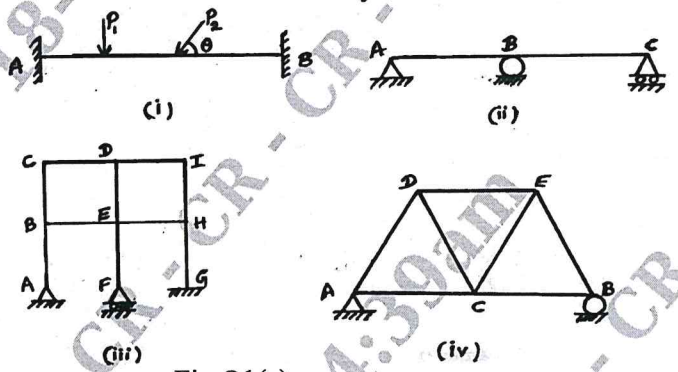

Fig.Q1(c) **(08 Marks)**

OR

2 A moving UDL of 20 kN/m and 8m long cross over a simply supported girder of span 20m. Determine
(i) Maximum positive shear force at 6 m from left support.
(ii) Maximum bending moment at 6 m from left support.
(iii) Absolute maximum bending moment anywhere on the beam.
(iv) Intensity of static UDL throughout the span. **(20 Marks)**

Module-2

3 A series of loads of 60 kN, 70 kN, 120 kN and 50 kN spaced at 2m, 3m and 2m crosses over a simply supported girder of span 20m from left to right with 60 kN load leading as shown in Fig.Q3. Determine :
(i) Maximum BM (Bending Moment) at 6m from the left support
(ii) Maximum SF (Shear Force) anywhere in the girder
(iii) Maximum BM under 70 kN load.
Use influence line principle.

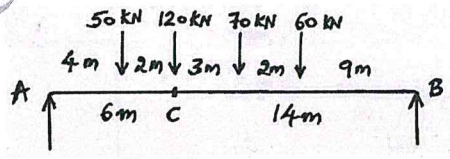

Fig.Q3 **(20 Marks)**

OR

4 The multiple point loads 100 kN, 120 kN, 120 kN, 80 kN and 150 kN with a spacing 2 m crosses a girder of span 30m from left to right with 100 kN load leading. Calculate :
(i) Reactions (ii) Maximum BM at a section 10m from left support
(iii) Absolute maximum BM. Use influence line principle. **(20 Marks)**

Module-3

5 a. Using Moment area method, determine the slope and deflection at free end of a cantilever beam subjected to point load 'P' at free end of span 'L' with constant 'EI'. **(08 Marks)**

b. Determine the maximum slope and deflection for the given simply supported beam as shown in Fig.Q5(b) by Conjugate beam method.

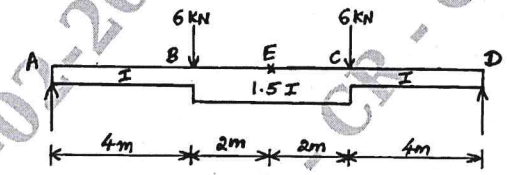

Fig.Q5(b) **(12 Marks)**

OR

6 a. Using Conjugate beam method, determine the slope and deflection at support for a simply supported beam subjected to UDL of "W/m" run over a span of 'L' m with constant 'EI'. **(10 Marks)**

b. Calculate the slope and deflection at B and C of the cantilever beam as shown in Fig.Q6(b). Taking EI constant for the whole length of the beam. Use moment area method.

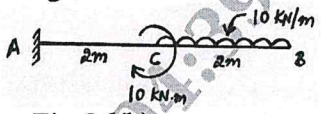

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. Obtain an expression for strain energy stored in a member when it is subjected to torsional moment. **(08 Marks)**

b. Using Castigliano's theorem, obtain slope and deflection at the free end A, for the beam shown in Fig.Q7(b). Take EI = 5000 kN.m^2 .

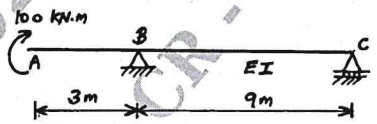

Fig.Q7(b) **(12 Marks)**

OR

8 a. Determine the deflection at the load point for the simply supported beam carrying point load at midspan by strain energy method. **(08 Marks)**

b. Determine the vertical and horizontal deflection at point C for the frame shown in Fig.Q8(b), by unit load method. Take EI = 6000 kN.m^2 .

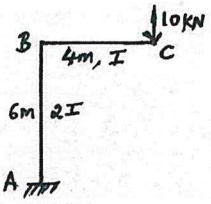

Fig.Q8(b) **(12 Marks)**

Module-5

9 a. Three hinged circular arch of span 10m and central rise 2.5m supports a point load of 100kN at left quarter span and a UDL of 20 kN/m over the right half of the span. Calculate the reactions, normal thrust, radial shear and BM at right quarter span point. **(12 Marks)**

b. A suspension cable having supports at same level has a span of 40m and maximum dip of 4m. The cable 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)**

OR

10 a. A cable of span 120m and dip 10m carries a load of 6 kN/m of horizontal span. Determine the maximum tension in the cable and the inclination of the cable at the support. Also determine the forces transmitted to the supporting pier, if the cable passes over smooth pulley on top of the pier. The anchor cable is at 30° to the horizontal. **(08 Marks)**

b. A three-hinged parabolic arch having supports at different levels of span 60m. Its abutments A and B are at depths of 15m and 30m from crown C. The arch carries UDL of 20 kN/m over the portion AC and a point load of 100 kN at a point 10m from B. Find the reactions, normal thrust, radial shear and BM at 15m from support A. **(12 Marks)**

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