15092

B. Tech 4th Semester Examination

Structural Analysis-I (OS)

CE-4001

Time : 3 Hours   **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Candidates are required to attempt five questions in all selecting one question from sections A, B, C, D and all the subparts of question in section E.

SECTION - A

1. (a) Define Castigliano's 1st theorem. Explain where is it used?   (2+2=4)

    (b) Find the horizontal deflection at joint C of the pin-jointed frame as shown in Fig. (1). AE is constant for all members.   (16)
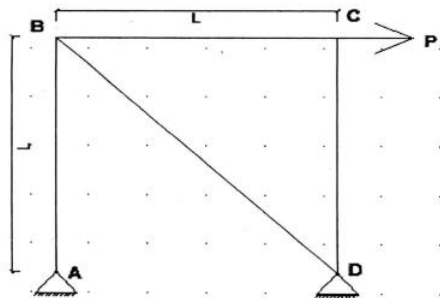

Fig. 1

2. (a) Define complementry energy.   (4)

(b   A simply supported beam of length L carries a concentrated load W at a point C as shown in Fig. 2. Find expressions for the total strain energy of the beam and the deflection under load.   (16)
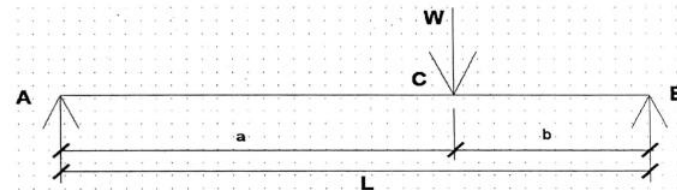

Fig. 2

SECTION - B

3. Analyse the continuous beam shown in Fig. 3 by slope-deflection method. Draw the bending moment and shear force diagrams. Young's modulus is same throughout.   (20)
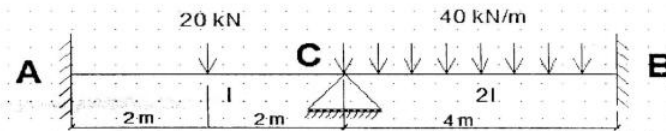

Fig. 3

4. Analyse the frame shown in Fig. 4 by moment distribution method and draw the bending moment diagram. Young's modulus is same throughout.   (20)
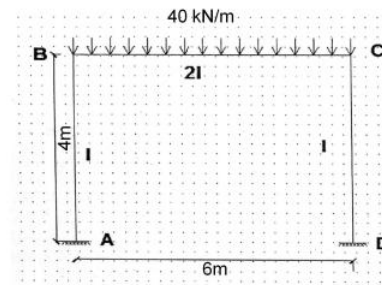

Fig. 4

SECTION - C
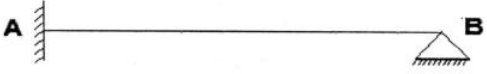
5. (a) A two hinged parabolic arch of span L and rise h carries a concentrated load W at the crown, determine the horizontal thrust at each support. (10)

   (b) A parabolic two hinged parabolic arch of span 32 m has a rise of 5 m. The arch carries point load of 10 kN, 5 m from the right support. Determine support horizontal thrust at the supports. (10)

6. (a) Define shear centre. (4)

   (b) Determine the principal moments of inertia for an unequal angle section 100mm x 75mm x 8mm. (16)

SECTION - D

7. (a) What is a suspension bridge?

   (b) Write the key advantages of the cable-stayed form of bridges.

   (c) A suspension cable has a span of 120 m and central dip of 12 m. It carries a uniform load of 1kN/m on the entire span. Calculate the maximum and minimum tension in the cable. (4+4+12=20)

8. A suspension bridge of 100 m span has two-hinged stiffening girders supported by two cables, having a central dip of 10m. The dead load on the bridge is 5 kN /m^2 and live load 10 kN/m^2, which covers the left half of the span. If the road is 7.5 m wide, determine the

   (i) shear force and bending moment for the girder at 25 m from the left end and

   (ii) maximum tension in the cable. (20)

[P.T.O.]

SECTION - E

9. Briefly answer all the following questions:

   (a) What is meant by indeterminate structures?

   (b) Define degree of indeterminacy.

   (c) Write the formulae for degree of indeterminacy for:

      (i) Two dimensional pin-jointed truss (2D Truss)

      (ii) Two dimensional rigid frames/plane rigid frames (2D Frames)

   (d) Find the indeterminacy for the beams given below.

   (e) Differentiate between pin-jointed and rigid jointed plane frames.

   (f) Give the expression for determining the tension T in a cable of a suspension bridge.

   (g) Define influence line.

   (h) What are the functions of stiffening girders in suspension bridges?

   (i) Explain briefly the advantages of the suspension bridges.

   (j) What are different types of arches? (10×2=20)