19.1.09

B. Arch. Part-II 3rd Semester Examination, 2009
Subject: Structural Engineering- I
Subject Code: CE 301(A)

Full Marks: 70 **Time: 3 hours**

Use separate answerscript for each half

FIRST HALF
(Answer Q. No.1 and any TWO from the rest)

Q1. Draw bending moment and shear force diagrams for the beam shown in Fig. Q1. Indicate the sign conventions followed.

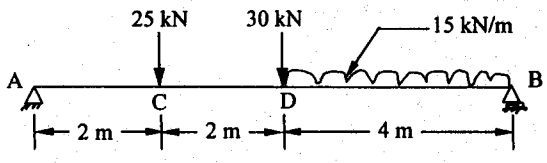

Fig. Q1

15

Q2. Fig. Q2 shows the cross-section of a beam which is subjected to a shear force of 20×10^3 N. Draw shear stress distribution across the depth marking values at salient points.

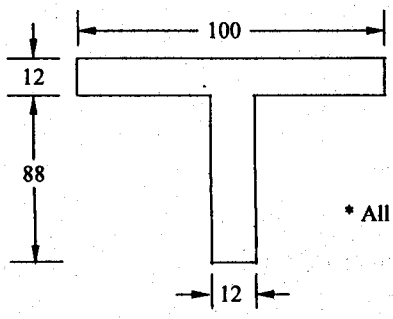

Fig. Q2 10

Q3. Evaluate slopes at both ends and the maximum deflection for the beam shown in Fig. Q3, EI = Constant, using the differential equation of Elastic Line.

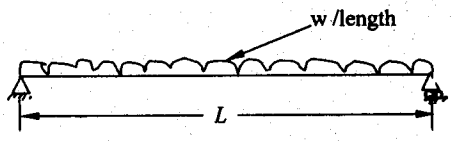

Fig. Q3 10

Q4. (a) State the two theorems of the Moment-Area Method.

(b) A simply supported beam AB carries a concentrated load 'P' as shown in Fig. Q4. Find the deflection of point 'C' and slope at 'A' using Moment-Area Method.

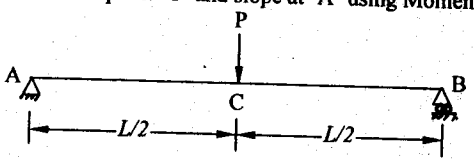

Fig. Q4 4+6=10

Q5. Analyze the propped cantilever beam shown in Fig. Q5 by the Method of Consistent Deformation. Draw the Bending Moment Diagram.

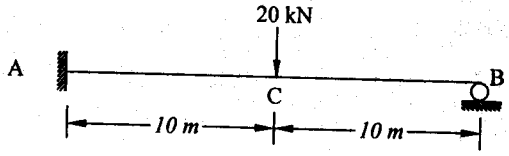

Fig. Q5

SECOND HALF

(Answer any THREE questions)

(Two marks are reserved for neatness)

Q6. ABCD is a three span continuous beam (Fig.Q6). Length of each span is "L" and carries uniformly distributed load of w/unit length. Calculate the value of Bending Moment at B and C using the equation of three moments. Also draw the Bending Moment Diagram for the said beam.

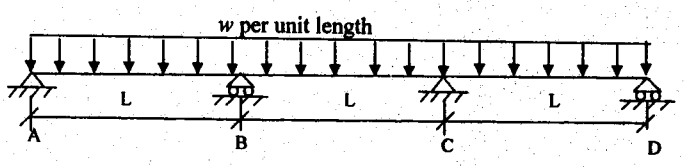

Fig. Q6

(11)

Q7. State Castigliano's first and second theorems. Using Castigliano's second theorem find the reactions of the supports of the two-span continuous beam carrying uniformly distributed load of w/unit length throughout its spans (Fig. Q7).

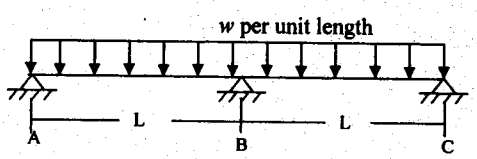

Fig. Q7

(11)

Q8. Using Castigliano's theorem find the deflection of the point "D" of the truss as shown in Fig. Q8. (11)

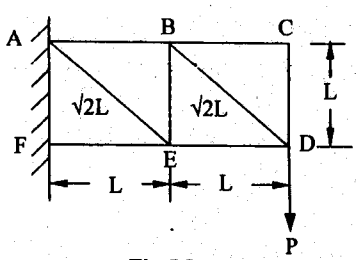

Fig.Q8

Q9. A beam AB of span 6.0 m carries a load of 50 kN at a distance 4.0 m from the left end (Fig. Q9). Using Conjugate Beam Method find (i) slopes at A and B, and (ii) deflection under the load. Given $E = 2 \times 10^5$ N/mm^2; $I = 8.325 \times 10^7$ mm^4.

(1i)

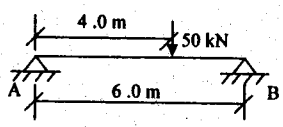

Fig. Q9

Q10. (a) Define column. What is the difference between a short column and a long column? Explain Euler's critical load for a long column.

(b) Derive an expression for Euler's critical load for a long column whose both ends are hinged.

(4+7=11)