B. Arch. Part-II 3rd Semester Examination, 2009-10

Subject: Structural Engineering- I

Subject Code: CE 301(A)

Full Marks: 70 Time: 3 hours

Use separate answerscript for each half

The questions are of equal value.

Assume reasonable data, if required. All notations have their usual meanings.

FIRST HALF

(Answer any THREE questions)

(Two marks are reserved for neatness)

Q1. Draw bending moment and shear force diagrams for the overhanging beam shown in Fig. Q1.

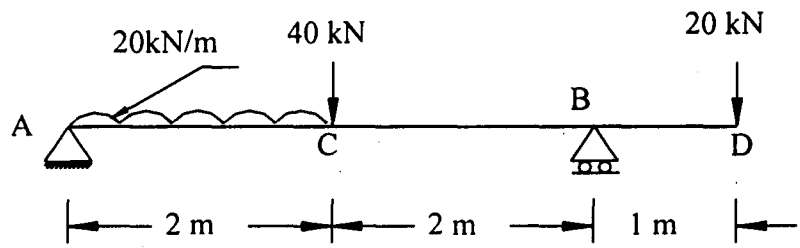
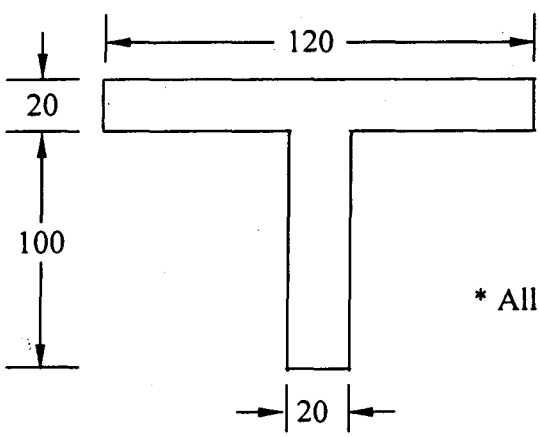


Fig. Q1

11

Q2. Fig. Q2 shows the cross-section of a beam which is subjected to a shear force of 50×10^3 N. Draw shear stress distribution across the depth marking values at salient points.

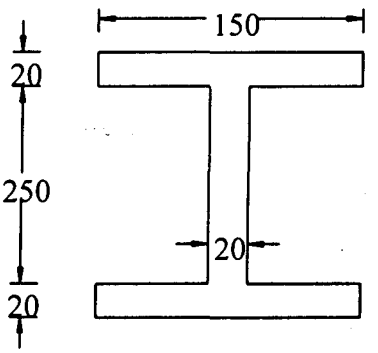


* All dimensions are in mm

Fig. Q2

11

Q3 A beam of span 'L' m simply supported at ends carries a central load 'W'. The beam section details has given in the Fig. Q3. If the maximum shear stress is to be 50 N/mm^2 when the maximum bending stress is 200 N/mm^2. Calculate the value of centrally applied load 'W' and the span 'L'.



*All dimensions are in (mm)

Fig. Q3

11

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

(b) A simply supported beam AB carries uniform distributed load (w/unit length) as shown in Fig. Q4. Find the deflection at centre and slope at 'A' using Moment-Area Method. EI = Constant.

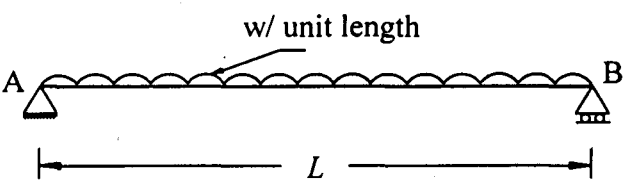


Fig. Q4

4+7=11

Q5. Analyze the continuous beam shown in Fig. Q5 by the Method of Consistent Deformation. Draw the Bending Moment Diagram. EI = Constant.

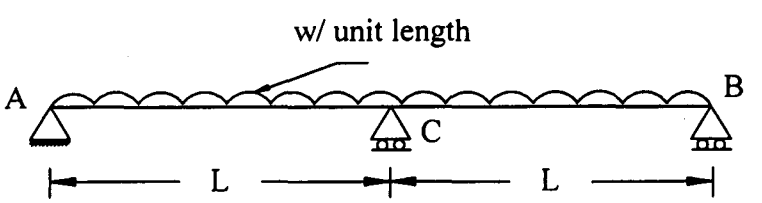


Fig. Q5

11

SECOND HALF

(Answer any THREE questions)

(Two marks are reserved for neatness)

Q6. (a) State Castigliano's first theorems.

(b) The quadrantal ring AB shown in Fig. Q6 is of radius 'r'. It supports a concentrated load 'P' at the free end 'A'. Find the vertical deflection at 'A' using Castigliano's first theorem. EI = Constant.

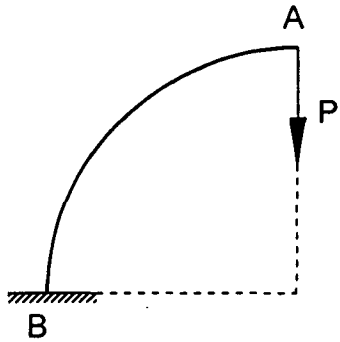


Fig. Q6

3+8 =11

Q7. Evaluate slope and deflection at free end for the cantilever beam shown in Fig. Q7 using the differential equation of Elastic Line. EI = Constant.

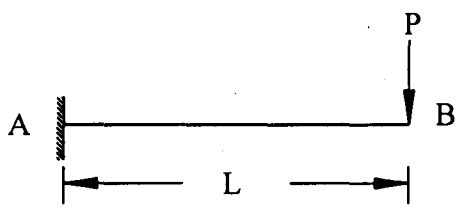


Fig. Q7

11

Q8. A beam carries two concentrated loads as shown in Fig. Q8. Using Conjugate Beam Method find (i) slopes at A, B, C and D, and (ii) deflection at B and C. Given E = 200 kN/mm^2; I = 2 × 10^{10} mm^4.

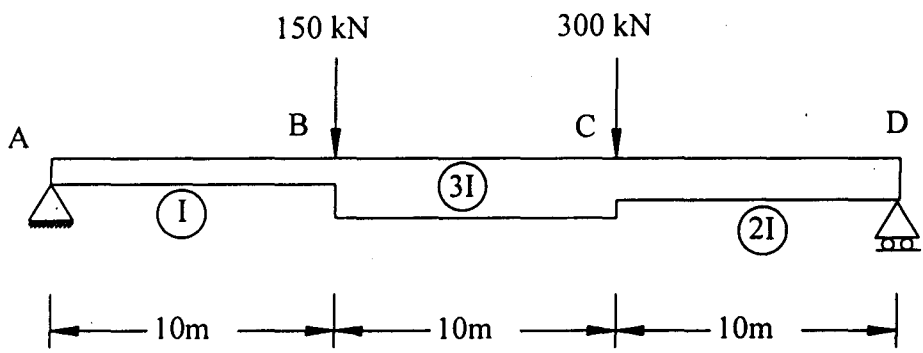


Fig. Q8

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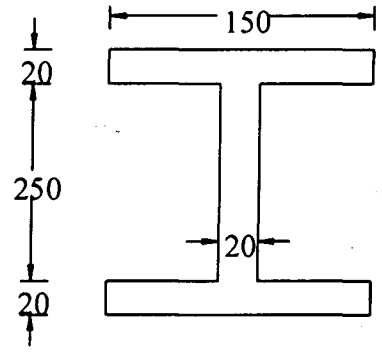

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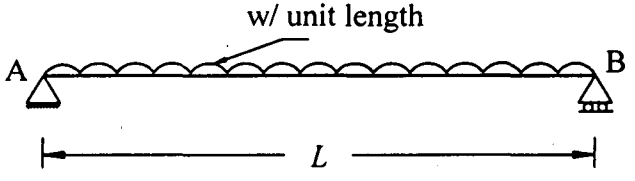

Fig. Q4

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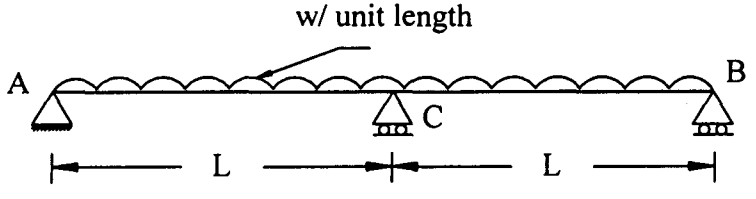

Fig. Q5

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SECOND HALF

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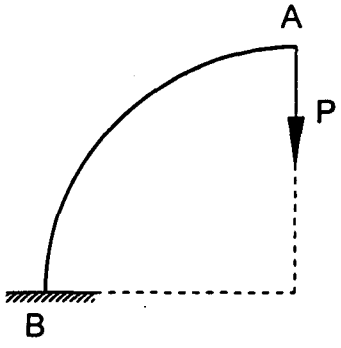

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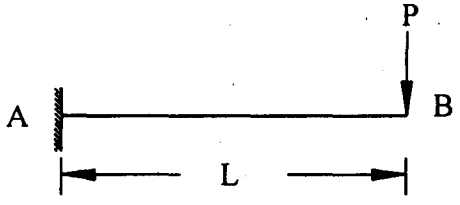

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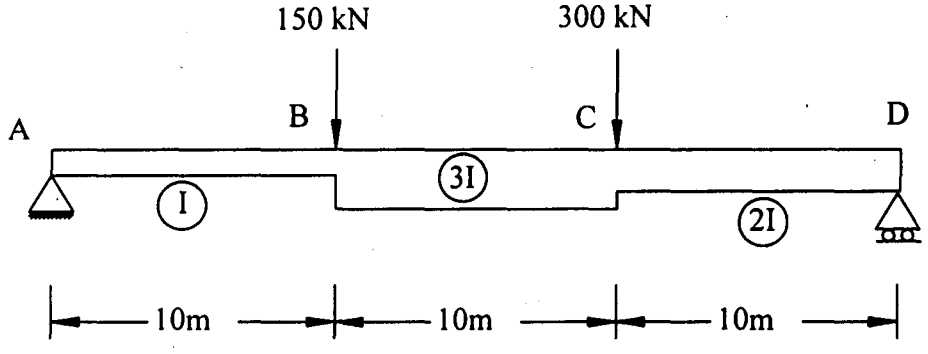

Fig. Q8

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Q9. (a) Define column. What is the difference between a short column and a long column?

(b) Derive an expression for Euler's critical load for a long column when one end is fixed and other end is free.

4+7=11

Q10. (a) State the assumptions in Euler's theory.

(b) A strut 3m long is 70mm in diameter. One end of the strut is fixed while its other end is hinged. Find the safe compressive load for the member using Euler's formula, allowing a factor of safety of 3.5. Take $E = 2.1 \times 10^5$ (N/mm^2).

4+7=11