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May 2016

Total No. of Questions—**12**] [Total No. of Printed Pages—**7**

Seat No.	

[4957]-110

S.E. (Civil) (Second Semester) EXAMINATION, 2016

STRUCTURAL ANALYSIS-I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6** from Section I.

(*ii*) Answer Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12** from Section II.

(*iii*) Answers to the two Sections should be written in separate answer-books

(*iv*) Neat sketches must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

(*vi*) Assume suitable data if necessary.

(*vii*) Use of non-programmable electronic scientific calculator is allowed.

SECTION I

1. (*a*) State Castigliano's first and second theorem. [4]

(*b*) A cantilever beam of 5 m span is subjected to udl all over the span of intensity 20 kN/m. Determine the maximum slope and deflection of the beam. [7]

P.T.O.

(*c*) Using moment area method, find the slope and deflection at the point C for a simply supported beam with uniform cross-section shown in Fig. 1. Take E = 2 × 10^5 MPa, I = 2 × 10^8 mm^4. [7]

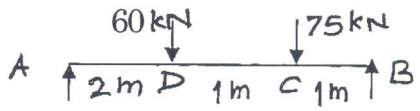

Fig. 1

Or

2. (*a*) Using Castigliano's first theorem, calculate the deflection at free end C of beam ABC beam shown in Fig. 2 : [7]

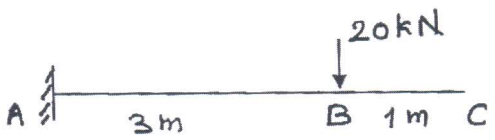

Fig. 2

(*b*) Determine the deflection and slope at quarter point C of simply supported beam AB of span '8 m' subjected to an uniformly distributed load 15 kN/m and point load of 10 kN acting at 5 m from end 'B'. Use conjugate beam method. [7]

(*c*) Explain with sketches the types and classification of structures based on structural forms. [4]

3. (*a*) Analyze the two span continuous beam ABC, using three moment theorem. Refer Fig. 3 : [8]

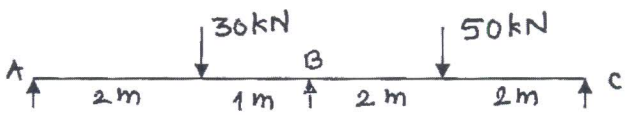

Fig. 3

(*b*) A fixed beam AB of span 10 m carries uniformly distributed load of 30 kN/m over span of 5 m from A. Find fixed end moments from first principles. Draw SFD and BMD. [8]

Or

4. (*a*) Analyze prop cantilever beam of span L subjected to udl W/m throughout the span and draw SFD and BMD. [8]

(*b*) A fixed beam of span 9 m carries two point loads of 40 kN and 50 kN acting at 3 m and 4 m from left support. Find fixed end moments by first principal and check the values with standard formula. [8]

5. Find the forces of the truss supported and loaded as shown in Fig. 4. The cross-section area of vertical and horizontal members is 3000 mm^2 and that of diagonals is 4500 mm^2. Also determine deflection at joint 'C'. [16]

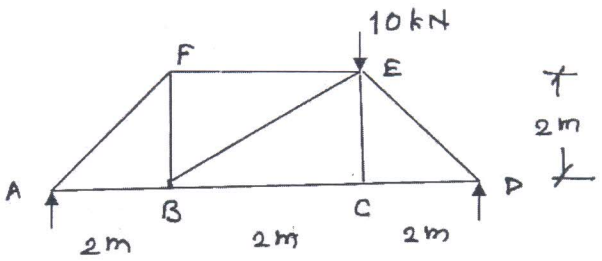

Fig. 4

Or

6. The truss shown in figure 5. Find central deflection. Take E = 200 kN/mm^2, if : [16]

(*a*) Area of all lower horizontal members = 1500 mm^2

(*b*) Area of all upper horizontal members = 2000 mm^2

(*c*) Area of all vertical members = 2000 mm^2

(*d*) Area of diagonal members = 2250 mm^2

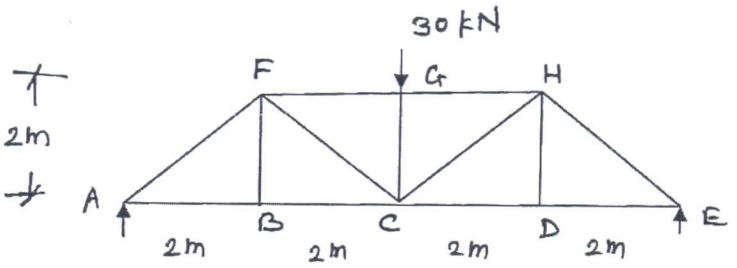

Fig. 5

SECTION II

7. (*a*) What is shape factor ? Explain load factor. [4]

(*b*) Find shape factor for an equilateral triangular cross-section with one of its side vertical. [7]

(*c*) Find the collapse load for a continuous beam ABC loaded as shown in Fig. 6. [7]

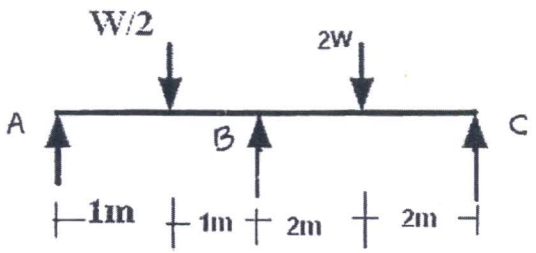

Fig. 6

Or

8. (*a*) State and explain the concept of plastic hinge. Explain step by step, how plastic hinge is developed in beams gradually applied load. Draw various shapes of stress diagram. [9]

(*b*) The frame loaded with a point load of 10 kN with both supports fixed is as shown in Fig. 7. Determine the values of plastic moment of the frame when loaded up to collapse. [9]

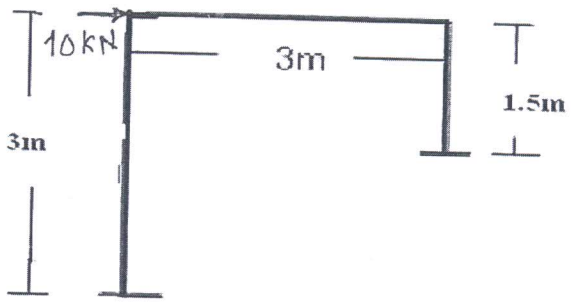

Fig. 7

9. (*a*) Draw ILD for the reaction at A, B and C. Also draw ILD for shear force at 2 m point from 'A' of AB and center of BC for the beam shown in Figure. 8 : [8]

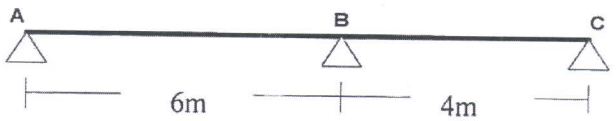

Fig. 8

(*b*) Construct ILD for the forces in the members U_1L_1, U_1L_0, L_2L_3 and U_2L_3 for the truss shown in Fig. 9 : [8]

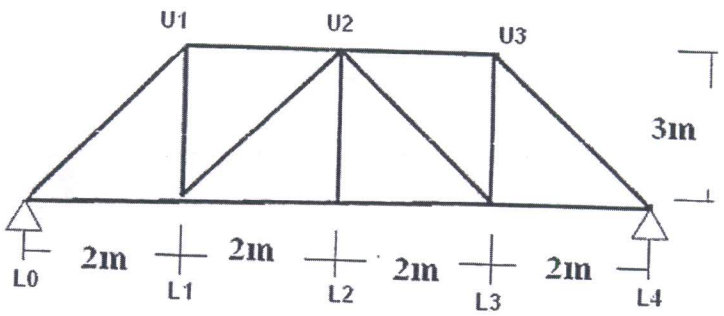

Fig. 9

Or

10. (*a*) Using influence lines, obtain reactions at support A and B for the beam ABCD with an overhang BC and AD. AB = 6 m, BC = AD = 1.5 m. It is loaded with central point load of 80 kN on span AB and 10 kN/m on span BC and a point load of 5 kN at free end 'D'. [8]

(*b*) Plot ILD for reactions at A and B supports and S.F. and B.M. at point 'E' and 'D' for the beam shown in Fig. 10 Assume l(CE) = l(EA) = 1 m, l(AD) = 3 m, l(DB) = 7 m. [8]

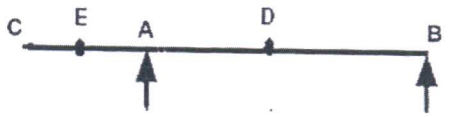

Fig. 10

11. (*a*) A uniformly distributed load of 150 kN/m of 7 m long crosses a girder AB of span 15 m. Calculate maximum shear force and maximum bending moment at a section 6 m from end A. [8]

(*b*) The train of loads crosses the girder AB as shown in Fig. 11. Find the maximum positive and negative end shear for the girder. Assume 180 kN load leading the train : [8]

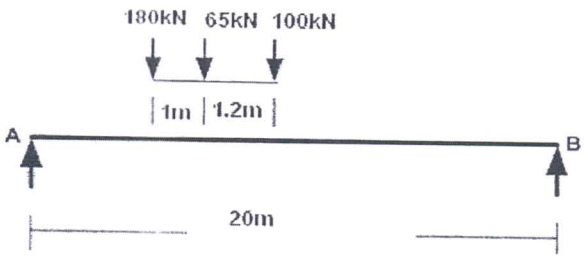

Fig. 11

Or

12. (*a*) Two wheel loads 425 kN and 175 kN are spaced 3.25 m apart and are moving on a girder AB of 16 m span. Any wheel can lead the other. Find :

(*i*) Max. positive and max. negative shear force at 7 m from 'A'

(*ii*) Maximum end shears. [8]

(*b*) Find absolute maximum bending moment under leading load 85 kN for the girder shown in Fig. 12. [8]

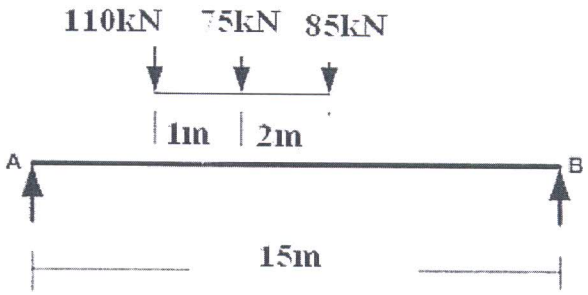

Fig. 12