

16038(J)

B. Tech 4th Semester Examination

Structural Analysis-I (NS)

CE-221

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 :
- (i) Attempt one question each from Sections A, B, C and D. Sections E is compulsory. All questions carry equal marks.
 - (ii) All Dimensions (Distance & Force units) are in "m & kN" except when specified otherwise (S.I Units).
 - (iii) Assume necessary data wherever required.

SECTION - A

1. Construct the internal forces diagram of portal frame for the following loaded portal frame as shown in Fig. 1. (20)

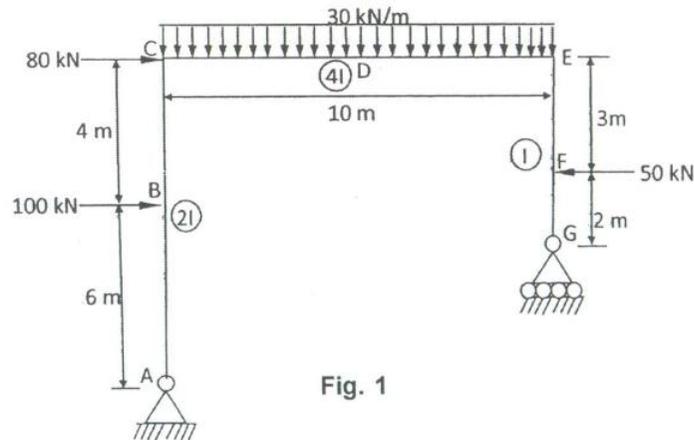


Fig. 1

2. A loaded cord ACDEFB spans 50 m is as shown in Fig. 2. The dip of the cord at D is 24 m below the left support A. The right support B is 6 m higher than the left support A. Find (a) the Reactions at the supports, (b) The Tensions in the various parts of the cable, (c) The inclinations of the various parts of the cable (Direction of Tension force), (d) The sag (or) Dip at E, C and F. (e) The total length of the cable and (f) Required cable cross sectional area if the safe tensile stress is $15 \times 10^4 \text{ kN/m}^2$. (20)

[P.T.O.]

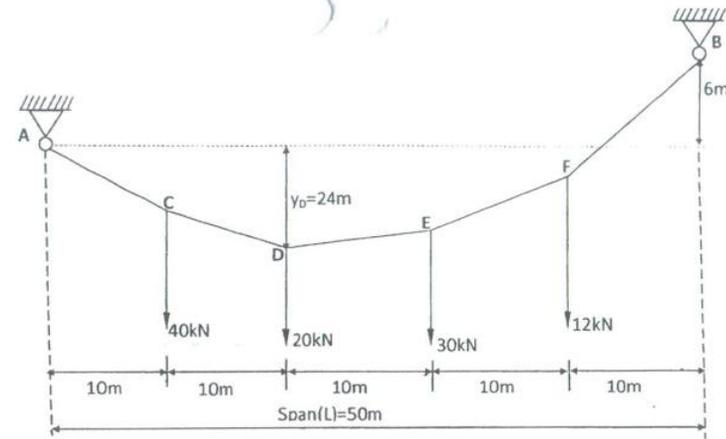


Fig. 2

SECTION - B

3. A train of 5 nos Concentrated Wheel loads as shown in Fig. 3 crosses a girder of 50m span from left to right. Using influence line diagrams (ILD), Calculate the maximum S.F & maximum B.M at a point 20m from the left supports and the absolute maximum bending moment anywhere in the span of simply supported beam. (20)

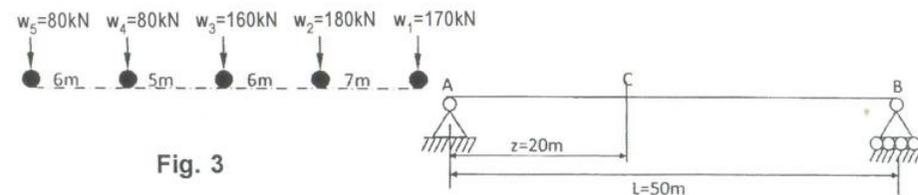


Fig. 3

4. Draw the influence line diagrams for (i) Bottom Chord Members (L_1-L_2) (ii) Top Chord Members (U_2-U_3) (iii) Vertical Members (U_3-L_4) (iv) Inclined or Diagonal Members (U_2-L_4) for the Through type of truss girder bridge as shown in Fig. 4. Also calculate the maximum forces in above members [(i) (ii) (iii) (iv)] of truss, when an U.D.L of 60KN/M, longer than the span, moves from left to right on the bottom chord. (20)

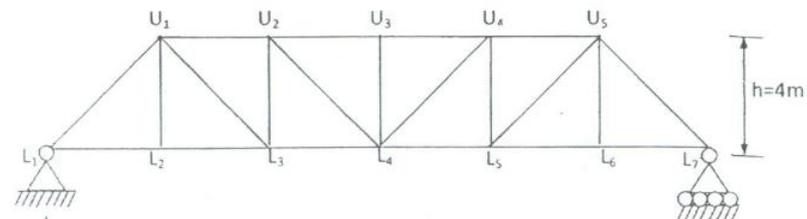


Fig. 4

SECTION - C

5. Analyse a determinate truss shown in Fig. 5 using unit load method and Calculate the Vertical deflection at E and Horizontal Deflection at D, If the area of cross section each members has 1200 mm^2 . Take $E=200 \text{ GPa}$. (20)

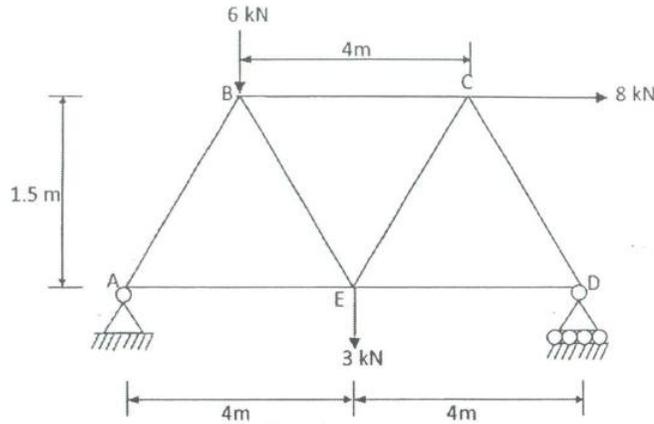


Fig. 5

6. A simply supported beam, of span 12m, carries loads as shown in Fig. 6. Calculate the Maximum slope and deflection of beam using Conjugate Beam method. (20)

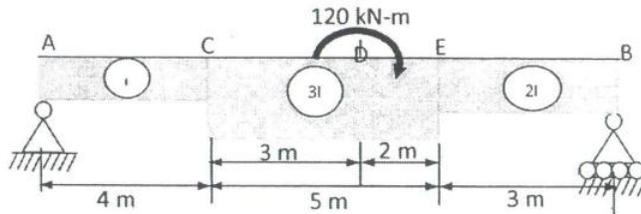


Fig. 6

SECTION - D

7. Analyze the rigid jointed building frame shown in Fig. 7 by Portal Method and Draw BMD & SFD for the frame. The cross sectional areas of columns are all assumed to be equal. (20)

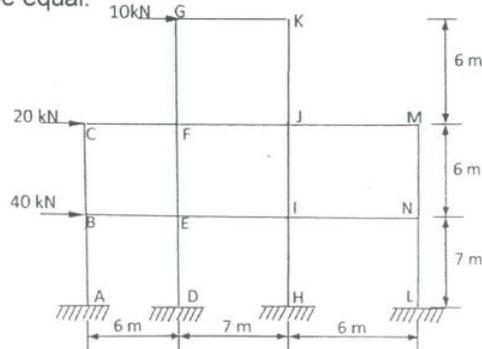


Fig. 7

[P.T.O.]

SECTION - E

8. Analyze the rigid jointed building frame shown in Fig. 7 by Cantilever Method and Draw BMD & SFD for the frame. The cross sectional areas of columns are all assumed to be equal. (20)

9. (i) Determine the Static Indeterminacy (S.I) for a beam shown in Fig (i).

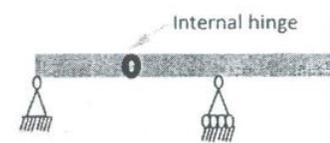


Fig. (i)

- (ii) Determine the Static Indeterminacy (S.I) for a truss shown in Fig (ii).

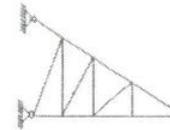


Fig. (ii)

- (iii) Determine the Kinematic indeterminacy (D.OF) for a frame shown in Fig (iii)

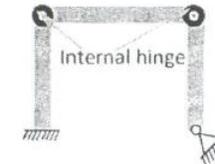


Fig. (iii)

- (iv) What are the differences between real and conjugate beam?
- (v) Explain briefly-Strain energy due internal forces like axial force, S.F, B.M & Torsion.
- (vi) How do you predict absolute maximum bending moment and shear force for beam with several rolling concentrated loads?
- (vii) Explain briefly - Theorem-I of Mohr's.
- (viii) Explain briefly - Principle of virtual work.
- (ix) What are the differences between analysis of framed structures by Castigliano's theorem and unit load method?
- (x) What are the differences between analysis of parabolic three hinged arch structures and semi-circular three hinged arch structures? (2×10=20)