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B.E. Fourth Semester (Civil Engineering) (C.B.S.)

Structural Analysis - I

P. Pages : 3 **KNT/KW/16/7263**

Time : Three Hours * 0 1 3 3 * Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Illustrate your answers whenever necessary with the help of neat sketches.
10. Use of non programmable calculator is permitted.

1. a) Analyse the Fixed Beam (Fig-1) by first principle and determine Fixed End Moments and Draw BMD. **11**

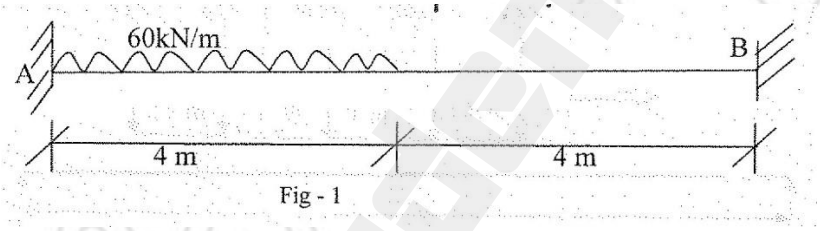

Fig - 1

b) Define Static Indeterminacy of Structure. **3**

OR

2. A continuous Beam ABCD carrying an external loading as shown in Fig. 2. If the support B sinks by 2.0 cm below the level of other support, find the support I = 15000 cm^4, E = $2x10^5$ N/mm^2 **14**

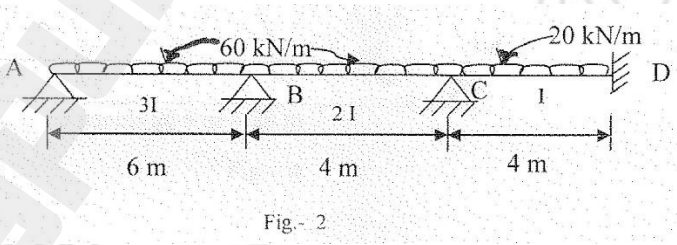

Fig.- 2

3. Rolling load as shown in Fig-3, is moving left to right on 40 m girder. Find Max BM, Max SF and @ 20 m from left support also calculate Absolute max BM and SF any where. **14**

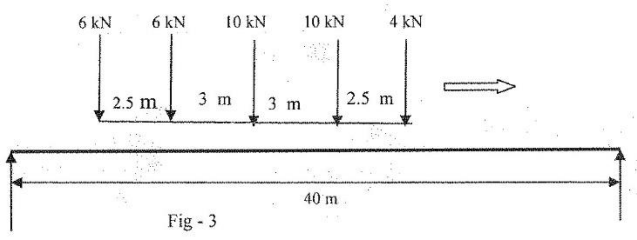

Fig - 3

OR

4. Draw ILD for U_2U_3, L_1L_2, U_2L_2 when unit load moves on Waren Truss as shown in Fig – 4 **14**

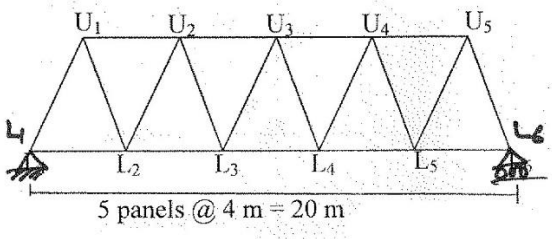

Fig - 4

5. a) State Castiglinos I Theorem **3**

b) Analyse the frame by strain energy method and draw B.M.D. frame is shown in Fig. 5 **10**

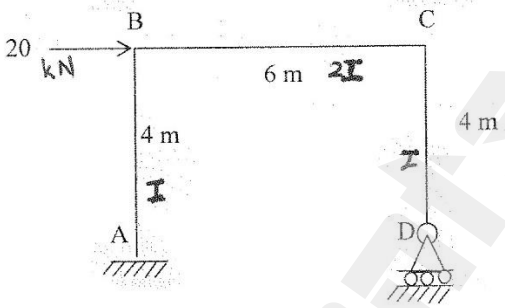

Fig. - 5

OR

6. Find the forces in the members of the truss shown in Fig. 6 using strain energy method. The area of the cross – section and modulus of elasticity of all the members are same. **13**

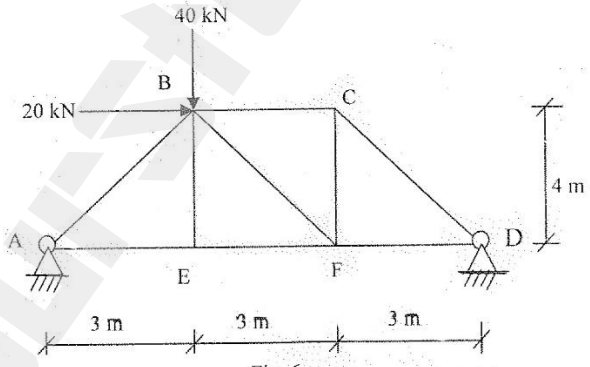

Fig. 6

7. A two hinged parabolic Arch. of 40 m span and 6 m rise with $I = I_c \sec\theta$ (usual notations), is subjected to u.d.l. of 10 kN/m over entire span and in addition a point load of 20 kN at the crown of Arch. Calculate horizontal thrust and draw B.M.D. Also calculate radial shear and normal thrust at left quarter span. **13**

OR

8. a) Derive from the first principle Euler's Crippling Load for the column of length ℓ with one end fixed and other end free. **6**

b) A hollow circular column has external diameter 80 mm and internal diameter 60 mm. find the Crippling load by Euler's formula, if one end is hinged and other end is fixed. The length of column is 6m. If the factor of safety is 2.0, find the safe load, $E = 2 \times 10^5$ N/mm^2. **7**

9. Analyse the continuous beam shown in Fig. 7 by slope deflection method, when Support C sinks by 10 mm. The beam is of constant stiffness through out. Assume EI = 8 x 10^9 kN-mm^2 **13**

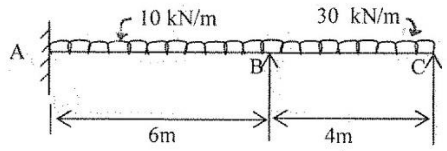

Fig. 7

OR

10. Two span intermediate frame of multi storeyed building is as shown in Fig-8. DL & LL of the beam may be taken as 15 kN/m & 20 kN/m respectively. If the wind loads of 15 kN are acting at joints A,B,C. Analyse the frame by Cantilever method. Assume all columns have equal cross section. **13**

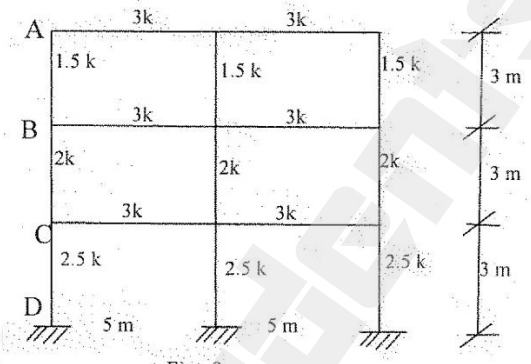

Fig - 8

11. Neglecting the weight of beam itself, find the ratio of I_1 to I_2 so that the magnitude of the bending moment at the centre is one third of that of the Fixed moment at the ends. Refer Fig-9. Use column analogy method. **13**

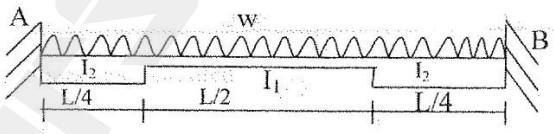

Fig - 9

OR

12. Using Flexibility Method. Analyse the Beam and Draw BMD. Fig-10 **13**

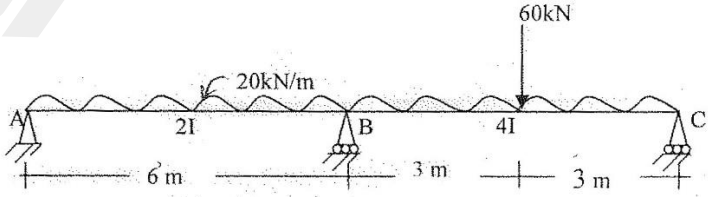

Fig - 10

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The best time to plant a tree was 20 years ago. The second best time is now.

~ Chinese Proverb