Fourth Semester B. E. (Civil) (CBS) Examination
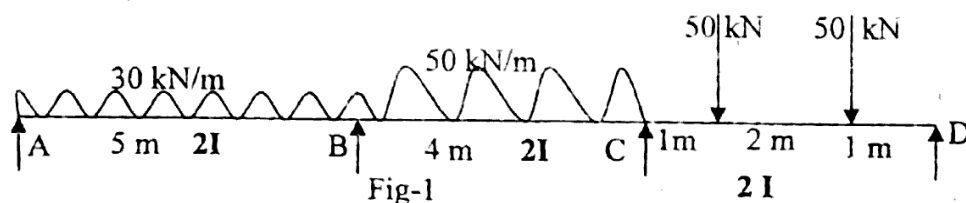
STRUCTURAL ANALYSIS – I

Time : Three Hours]   [Max. Marks : 80

N. B. : (1) All questions carry equal marks.
       (2) Answer all questions.
       (3) Due credit will be given to neatness and adequate dimensions.
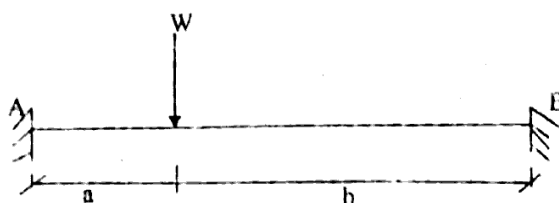   (4) Assume suitable data wherever necessary.

1. Analyse the continuous beam by three moment theorem and draw BMD. Refer fig. 1.

Fig-1

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OR

2. (a) Define degree of Static Indeterminacy of a structure.

5

   (b) Determine Fixed End Moments and draw BMD, by First Principle. Refer fig. 2.

Fig. 2

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Contd.

3. The load system shown in fig. 3 moves from right to left along a girder of span 20 m.

    (a) Find the maximum SF and BM at section 7.5 m from left end.

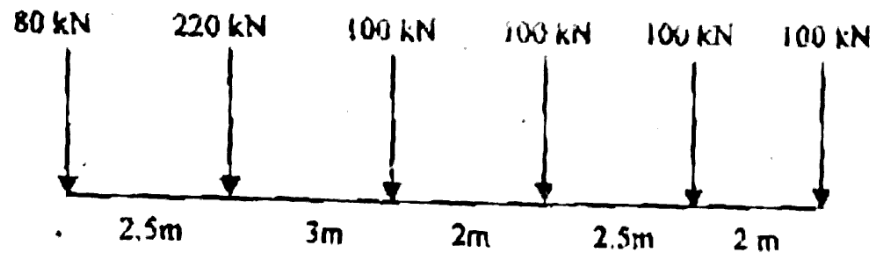   (b) Find Absolute Max. B. M. anywhere in the span.

80 kN   220 kN   100 kN   100 kN   100 kN   100 kN

2.5m   3m   2m   2.5m   2 m

Fig - 3

14

OR

4. Draw the influence lines for forces in the members $U_2 U_3$, $U_2 L_3$ of the truss shown in Fig. 4. If a live load of 6.5 kN/m, longer than the span, traverses the girder, find maximum values of forces in the members mentioned above.
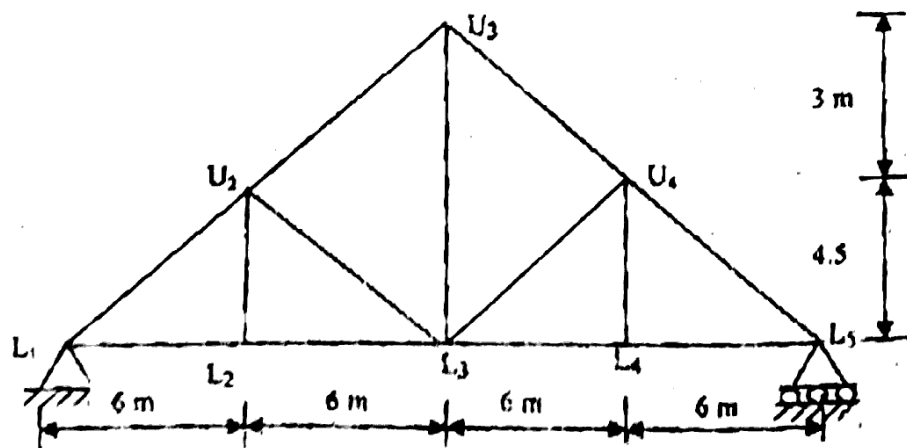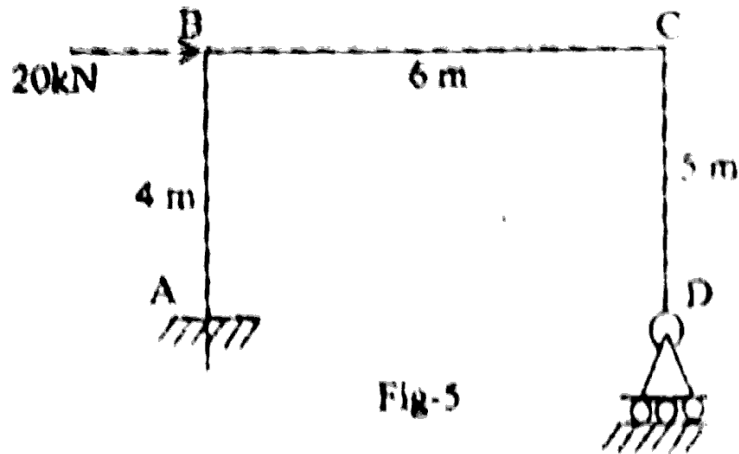

Fig.4

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5. Analyse the frame by Strain Energy Method and draw B. M. D. Frame is shown in fig. 5.

Fig-5

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OR

6. Find the vertical deflection of the joint D of the truss. The cross sectional area in mm^2 is shown in Fig. 6 along the member $E = 2 \times 10^8$ N/m^2.
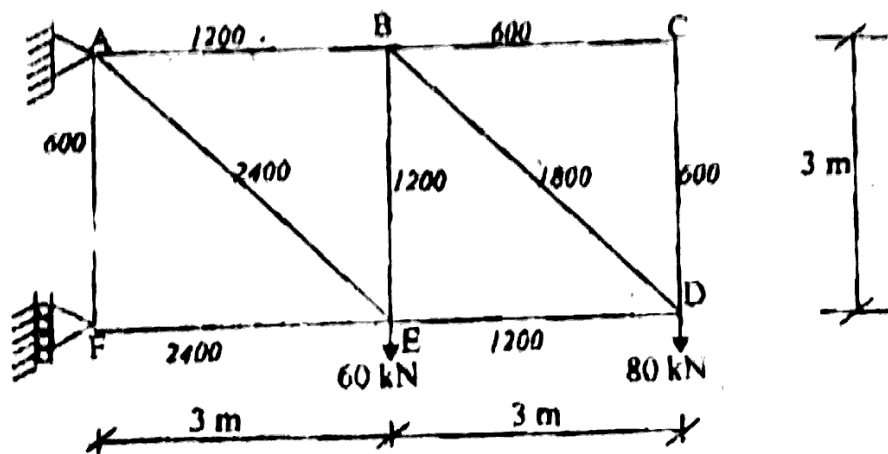

Fig-6

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7. (a) Derive the Rankine's formula for bucking of column and clarify the statement "Rankine formula is applicable for any length of the column". 6

(b) Determine the ratio of the strength of a solid steel column of that of a hallow column of the same material and having the same cross – sectional area. The internal dia of hallow column is 3/4 of the external dia. Both the columns have the same length and are pinned at both ends. 7

OR

8. A two hinged parabolic arch of 20 m span and 3 m rise with $I = I_c \sec \theta$ (usual notations), is subjected to u. d. l. of 10 kN/m over left half. Calculate horizontal thrust, radial shear and normal thrust at left quarter span. 13

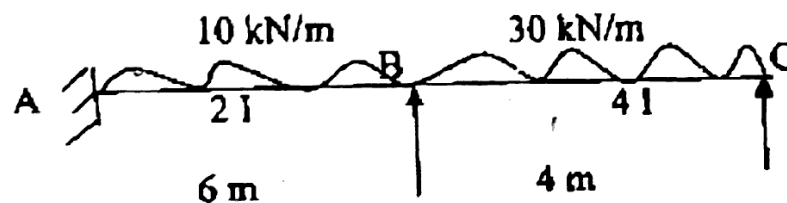9. Analyse continuous beam shown in figure 7 using Slope deflection method..

FIG - 7

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OR

10. (a) What do you understand by a Substitute frame ? Discuss in brief the method of Analysis. 6

(b) Tabulate the Loading and Fixed End Moments for the Intermediate Frame of a multistoreyed building, as shown in Fig. 8. The frames are spaced at

4 m centre to center. Take live load of $4000 \, N/m^2$ and dead load as $3000 \, N/m^2$, $3250 \, N/m^2$, $2750 \, N/m^2$ for the panels AB, BC and CD respectively. The self weight of Beams may be taken as,

Beams of 7 m span = 5000 N/m

Beams of 5 m span = 3500 N/m

Beam of 3.5 m span = 2500 N/m
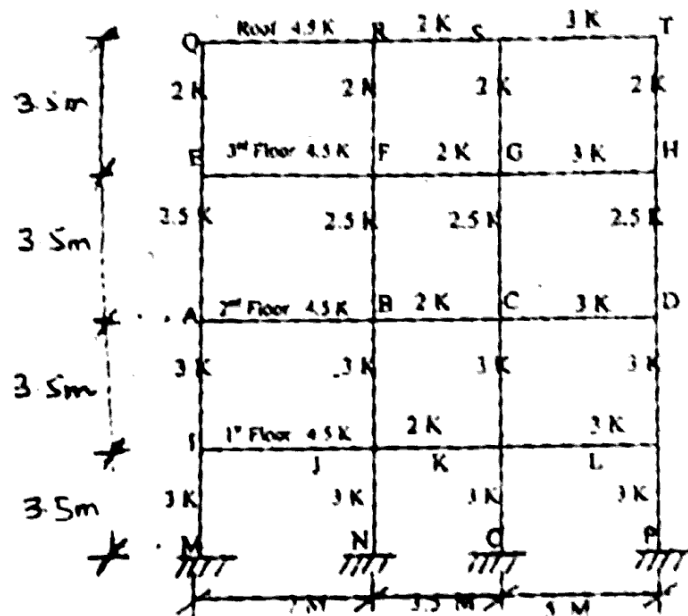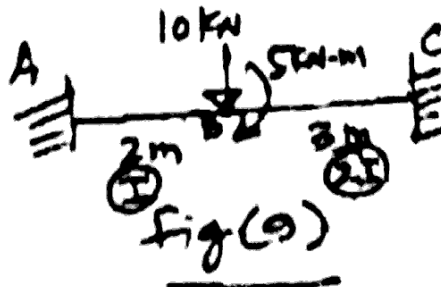
Relative stiffness are as mentioned on the frame.

Fig - 8

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11. Analyse the fixed beam shown in Fig. 9 by Column Analogy Method.

Fig (9)

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12. A two span continuous beam of constant flexural rigidity carries udl over entire length as shown in fig. 10. Analyse the beam by Flexibility Method. Consider Moment reaction at A and Vertical Reaction at B as redundant forces.
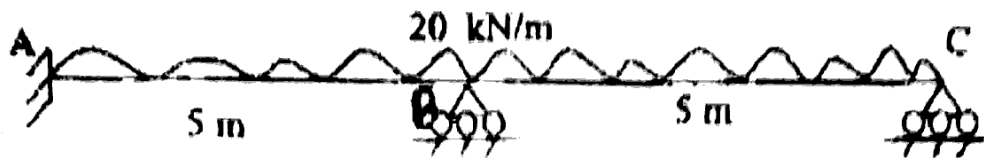

Fig. - 10

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