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

Structural Analysis - I

P. Pages : 3 **NIR/KW/18/3348**

Time : Three Hours 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. Analyse the continuous beam ABC shown in fig. (1) and plot BMD using three moment equation. **13**

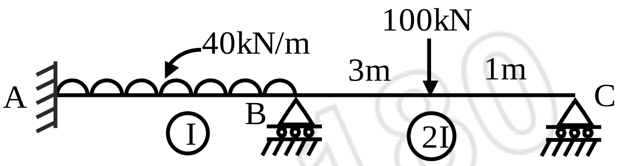


Fig. (1)

OR

2. Analyse the beam ABCD as shown in fig. (2) if support B sink by 10 mm. Given $\in = 200\,kN/mm^2$ and $I = 1\times10^8\,mm^4$. **13**

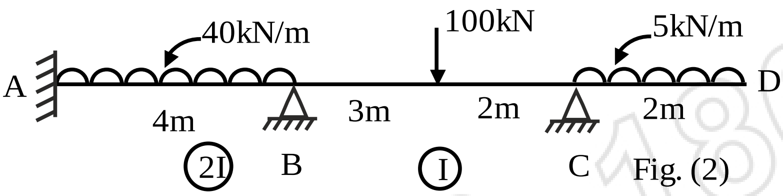
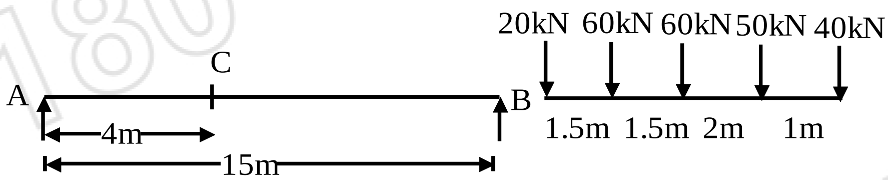


Fig. (2)

3. The system of concentrated load as shown in fig. (3) rolls from left to right on the girder of span 15 m, 40 kN load leading. For a section 4 m from left support determine. **13**

i) Maximum bending moment.

ii) Maximum shear force



OR

4. Draw the influence line diagram for forces in member U_3U_4, U_3L_4 and L_3L_4 of frame shown in fig. (4) and find maximum forces developed, when uniformly distributed load of intensity longer 40 kN/m the span moves from left to right on top chord. **13**

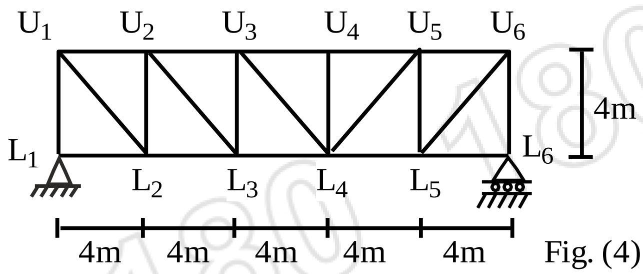


Fig. (4)

5. Analyse the frame by strain energy method and draw BMD. Frame is shown in fig. (5) **13**

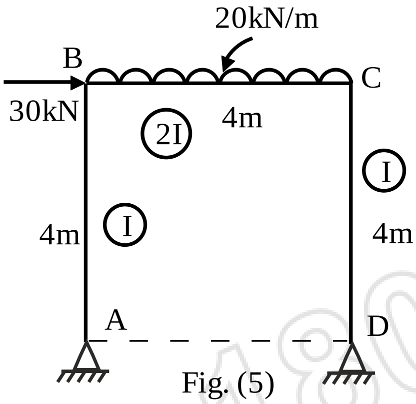


Fig. (5)

OR

6. Determine the vertical deflection of point D. in the truss shown in fig. (6). The cross sectional areas of members AD and DE are $1600\,\text{mm}^2$. While those of the other members are $900\,\text{mm}^2$. Take $E = 180\,\text{kN}/\text{mm}^2$. **13**

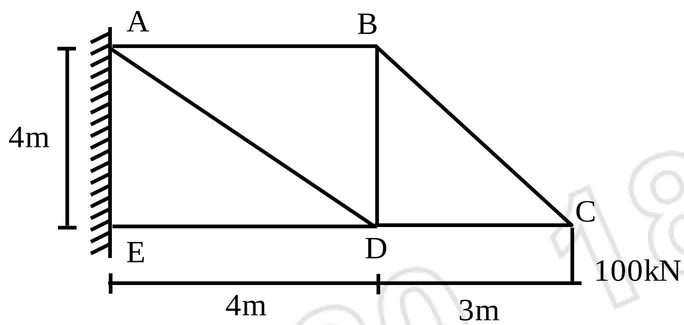


Fig. (6)

7. a) Derive from the first principle. Euler's crippling load for the column for length 'ℓ' with one end fixed and other end free. **7**

b) Explain the Rankine's theory for determining load carrying capacity of column. **7**

OR

8. A two hinged parabolic arch with 35 m span and 8 m rise is subjected to udl of $15\,\text{kN}/\text{m}$ over left half of arch. Find the reaction at support, normal thrust and radial shear at a section 12 m from left support. Take $I = I\,\text{cosec}\,\theta$ with usual notations? **14**

9. Analyse the portal frame shown in fig. (7) using slope and deflection method also draw the BMD. **14**

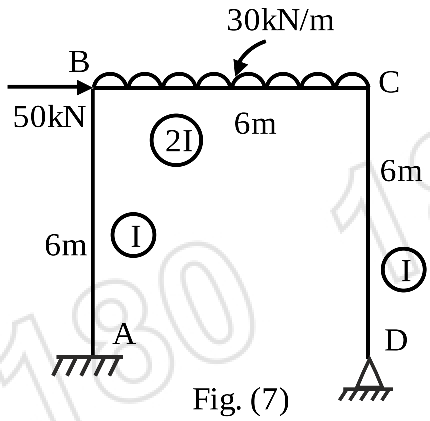


Fig. (7)

OR

10. Analyse the frame shown in fig. 8 by cantilever method and draw BMD of column and beam. **14**

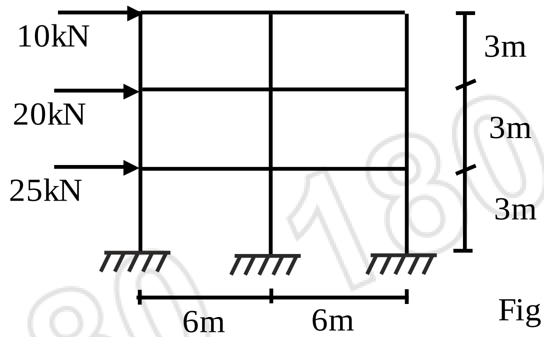


Fig (8)

11. Analyse the beam by flexibility method and draw BMD. Refer fig. 9. **13**

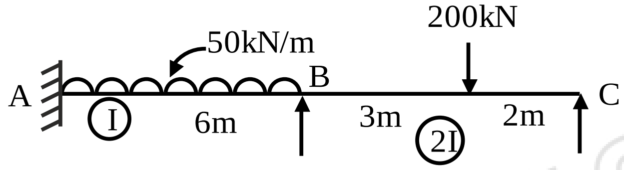
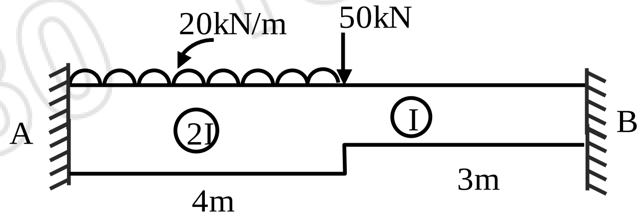


Fig. (9)

OR

12. Analyse the fixed beam shown in fig. 10 by column Analogy Method. **13**



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Structural Analysis - I

P. Pages : 3 | NJR/KS/18/4403

Time : Three Hours | Max. Marks : 80

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1. Analyse the continuous beam ABCD shown in fig. (1) and plot BMD using three moment equation. **13**

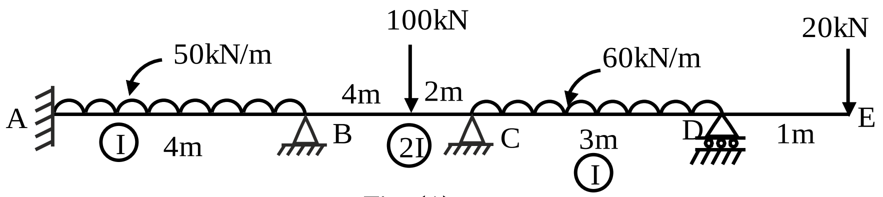


Fig. (1)

OR

2. Analyse the continuous beam ABC shown in fig. (2) if support B sinks by 10 mm. Given $E = 200\,kN/mm^2$ and $I = 1 \times 10^8\,mm^4$. **13**

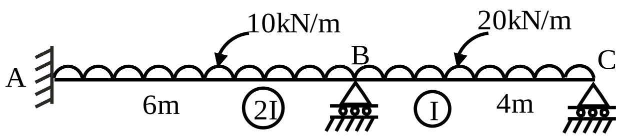


Fig. (2)

3. Four point loads 8, 15, 15 and 10 kN have centre to centre spacing of 2m between consecutive loads and they traverse a girder of 30 m span. from left to right with 10 kN load leading. Calculate the maximum bending moment and shear force 8 m from left support, shown in fig. (3). **13**

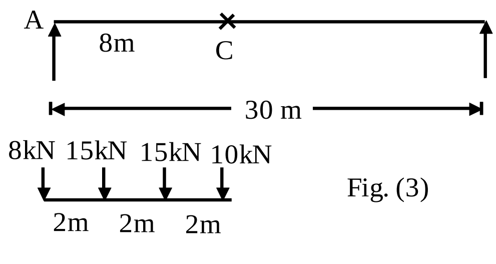


Fig. (3)

OR

4. Draw the influence line diagrams for forces in members u_2u_3, u_2L_3 and L_2L_3 of truss shown in fig. (4) when uniformly distributed load 60 kN/m longer than the span moves from left to right on top chord. **13**

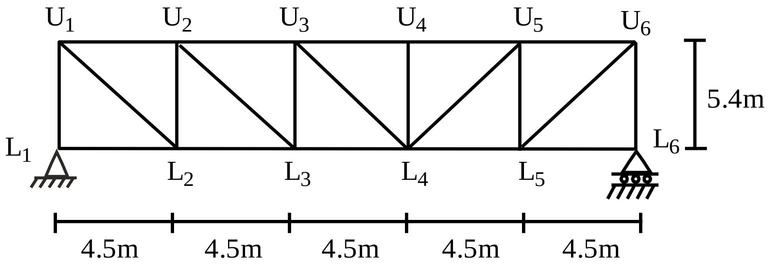


Fig. (4)

5. Analyse the frame shown in fig. (5) by strain energy method and draw BMD. **13**

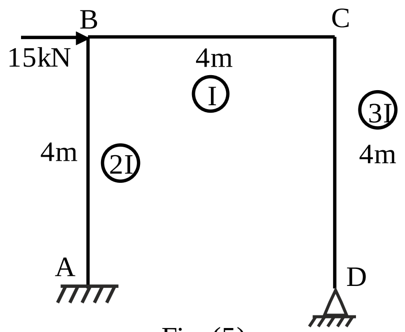


Fig. (5)

OR

6. Using the strain energy method find forces in all the member of truss loaded as shown in fig. (6). The C/S area of all the members is same and they made up of same material. **13**

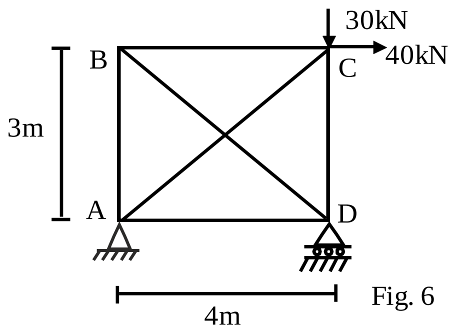


Fig. 6

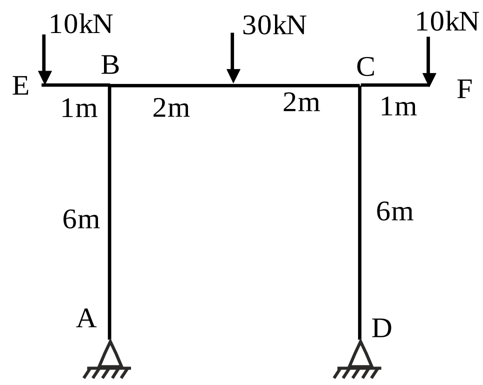
7. a) Derive the Rankine's formula for buckling of column and clarify the statement "Rankine formula is applicable for any length of the column" **7**

b) Derive from the first principle, Euler's Crippling load for the column for length 'ℓ' with both end hinged. **7**

OR

8. A two hinged parabolic arch of 40 m span and 6 m rise with $I = I_c \sec\theta$ (usual notations), is subjected to udl 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 BMD. Also calculate radial shear and normal thrust at left quarter span. **14**

9. Analyse the portal frame shown in fig. (7) using slope deflection method and draw BMD. **14**



OR

10. Analyse the frame shown in fig. (8) by cantilever method and draw BMD of beam and columns. **14**

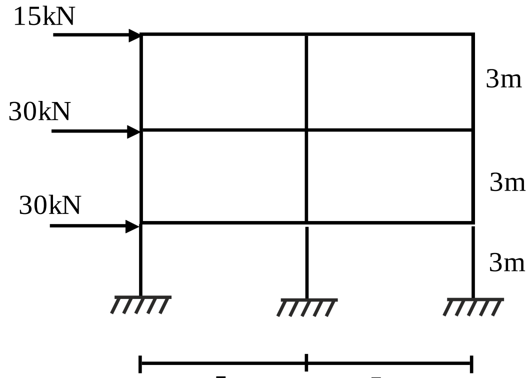


Fig. (8)

11. Analyse the beam by flexibility method and draw BMD. Refer fig. No. (9). **13**

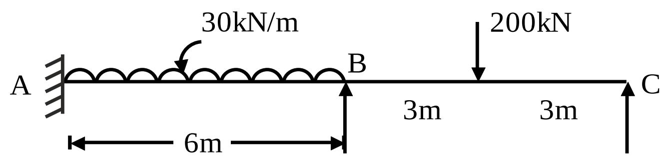


Fig. No. (9)

OR

12. Analyse the fixed beam shown in fig. (10) by column Analogy method. **13**

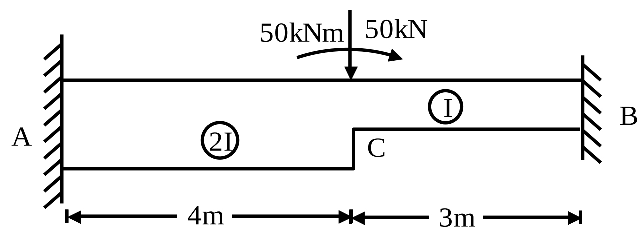


Fig. 10

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

Structural Analysis - I

P. Pages : 3 **NRJ/KW/17/4403**

Time : Three Hours Max. Marks : 80

Notes :
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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. Analyse the continuous Beam by three moment theorem and draw BMD. Refer fig. 1. **14**

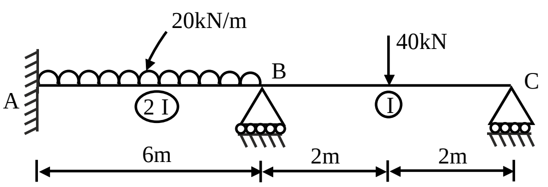

Fig. 1

OR

2. Determine the fixed end moment in the beam as shown in fig. (2). and plot the BMD. If support B sinks down by 20mm. Take $E = 2\times10^5\ N/mm^2$ and $I = 40\,x\,10^6 mm^4$. **14**

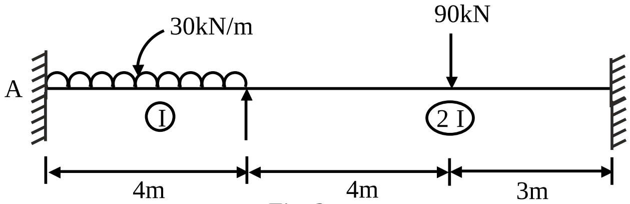

Fig. 2

3. Rolling load as shown in fig.3. is moving left to right on 40m girder. Find maximum bending moment, Max. SF at 20m from left support. Also calculate absolute max. BM and SF any where. **13**

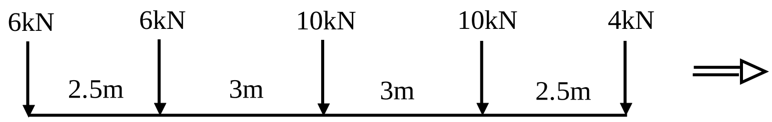

Fig. 3

OR

4. Draw the Influence lines for the forces in the members $U_2\ U_3$, $L_2\ L_3$ 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. **13**

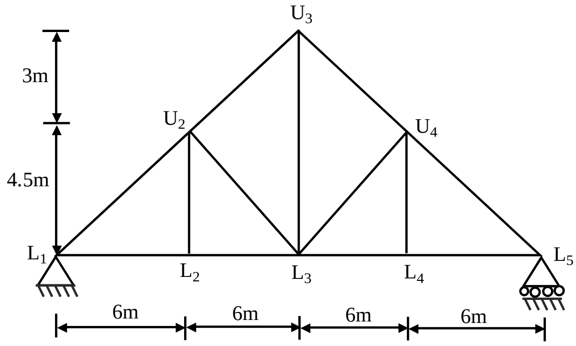

Fig. 4

5. Analyse the frame shown in fig.5. by strain energy method and draw BMD. **13**

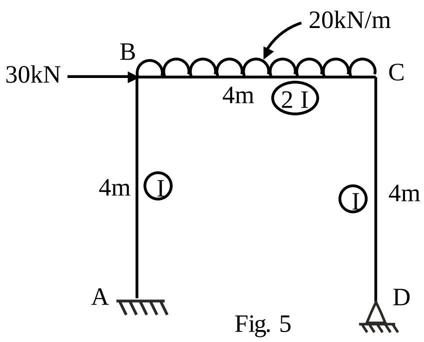

Fig. 5

OR

6. Find the forces in the member of the truss shown in fig.6. by using strain energy method. The cross sectional area and modulus of elasticity of all members are the same. **13**

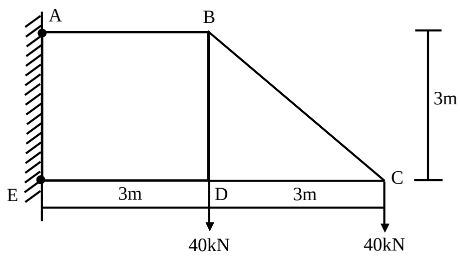

Fig. 6

7. a) Derive from the first principle Euler's Crippling load for the column of length 'L' with one end fixed and other end free. **7**

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 diameter of hallow column is ¾ of the external diameter. Both the columns have same length with one end fixed and other end pinned. **6**

OR

8. A two hinged parabolic arch with 35m span and 8m rise is subjected to udl of 15 kN/m over left half of arch. Find the reaction at supports, normal thrust and radial shear at a section 12m from left support. Take $I = I_c \sec\theta$ with usual notations. **13**

9. Analyse the portal frame shown in fig.7. Using slope deflection method and draw BMD. **14**

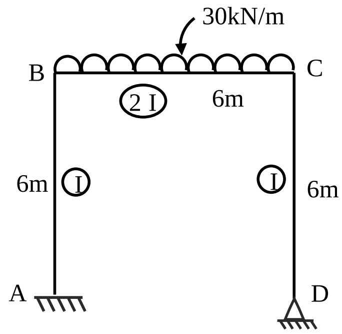

Fig. 7

OR

10. Analyse the frame shown in fig.8. by cantilever method and draw BMD of beam and columns. **14**

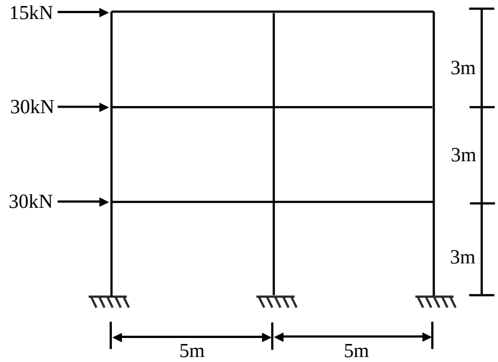

Fig. 8

11. Analyse the beam by flexibility method and draw BMD. Refer fig.9. **13**

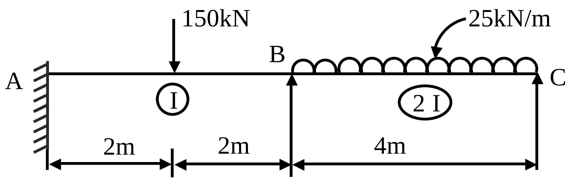

Fig. 9

OR

12. Analyse the fixed beam shown in fig.10. by column Analogy method. **13**

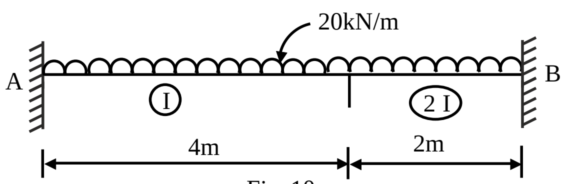

Fig. 10

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

Structural Analysis - I

P. Pages : 3 **NKT/KS/17/7263**

Time : Three Hours Max. Marks : 80

Notes :
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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 continuous beam is loaded as shown in fig. 1 If support 'B' Sinks by 10mm, find the moments and reaction at support and Draw BMD by three moment theorem. **13**
Take E = 2×10^8 kN/m^2 & I = 8.5×10^{-5} m^4

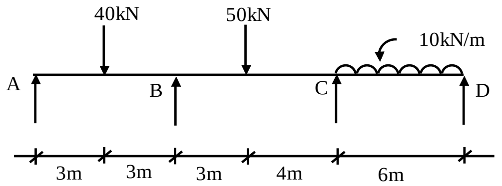

Fig. 1

OR

2. Analyse the continuous beam as shown in fig. 2 by using three moment equation and Draw BMD assume uniform EI. **13**

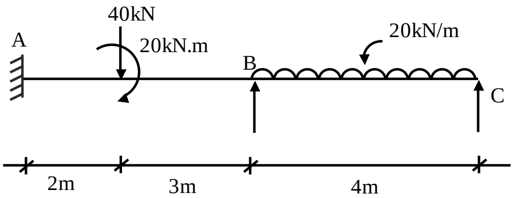

Fig. 2

3. Five rolling loads as shown in fig. 3. are crossing a simply supported beam of 15m span. Calculate **13**

i) Max '+' ve and '–' ve SF at 5 m from left support

ii) Max BM. at 5m from left support

iii) Absolute Max^m BM anywhere in span.

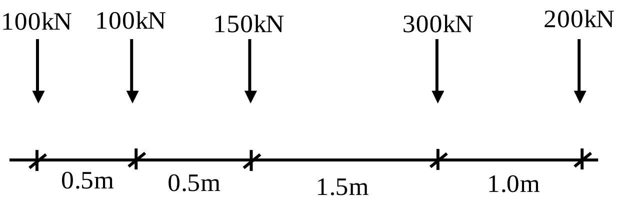

Fig. 3

OR

4. For the deck type of truss as shown in fig. 4) Draw ILD for **13**

i) Force in member BC

ii) Force in member BD

iii) Force in member BE

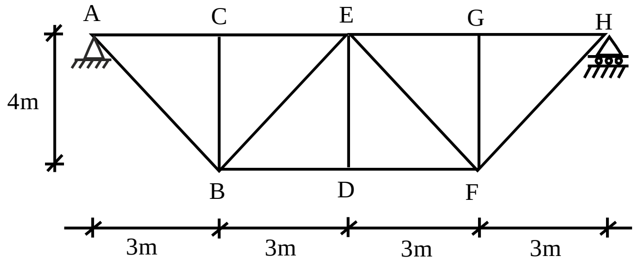

Fig. 4

5. Analyse the frame as shown in fig. 5. by strain energy method and draw BMD. **14**

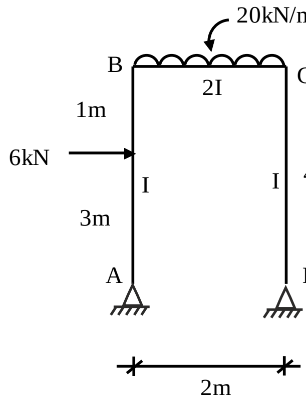

Fig. 5

OR

6. Using the strain energy method find forces in all the member of truss loaded as shown in fig. 6. The c/s area of all the members is same and they made up of same material. **14**

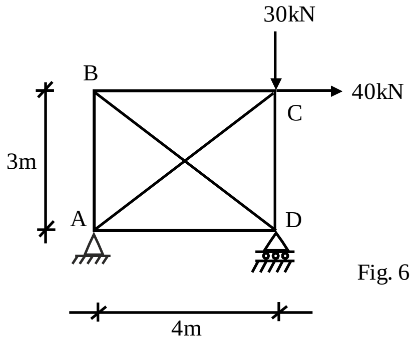

Fig. 6

7. a) Derive expression of Euler buckling load of column for both ends hinged. **7**

b) What are the limitation of Euler formula? Explain by taking example of steel column. **7**

OR

8. A two hinged parabolic arch of 16 m span and 3 m rise with $I = I_C \sec\theta$ (usual notation), if subjected to UDL of 10 kN/m over left half and 20 kN at the crown of arch. Calculate horizontal thrust and Draw BMD. Also calculate radial shear. **14**

9. Analyse the portal frame by slope deflection method. Draw BMD ref. Fig. 7. **13**

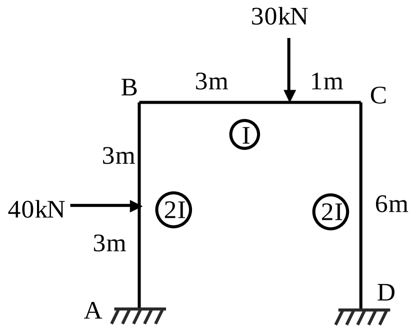

Fig. 7

OR

10. Analyse the frame as shown in fig. 8 by cantilever method. Area of each exterior column is one half of the area of interior column. **13**

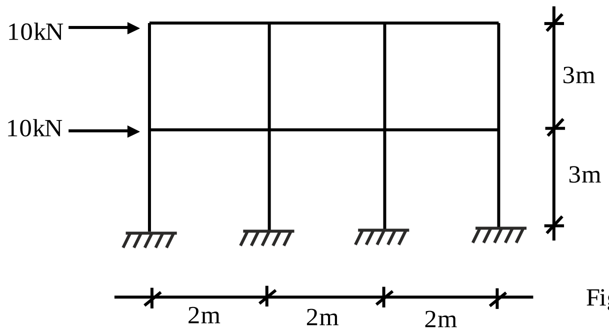

Fig. 8

11. Analyse the beam shown in fig 9 by flexibility method and draw BMD. **13**

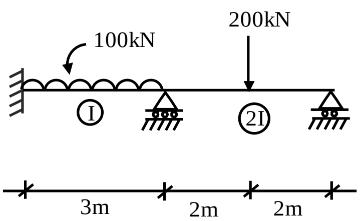

Fig. 9

OR

12. Analyse the fixed beam shown in fig. 10 by column analogy method. Draw BMD. **13**

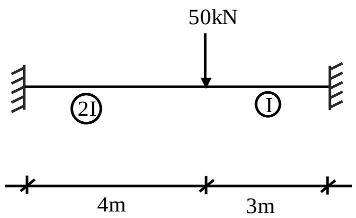

Fig. 10

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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 Max. Marks : 80

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

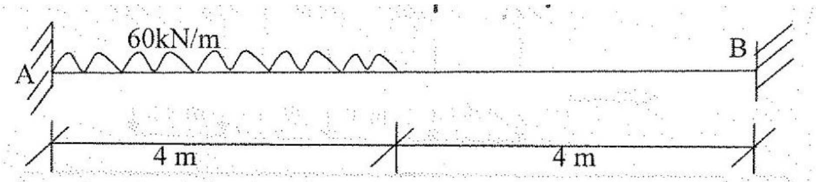

Fig - 1

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**

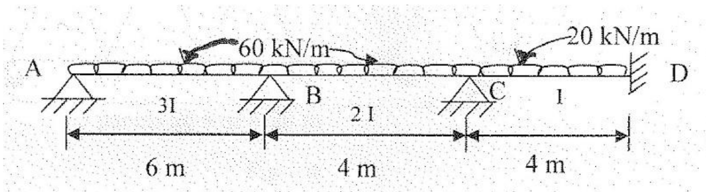

Fig. - 2

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**

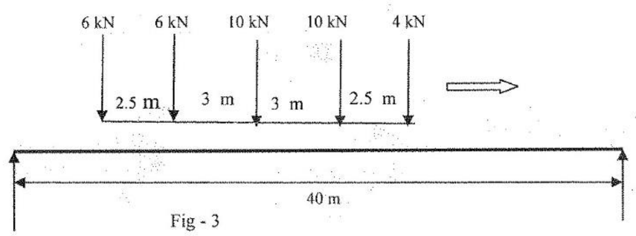

Fig - 3

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**

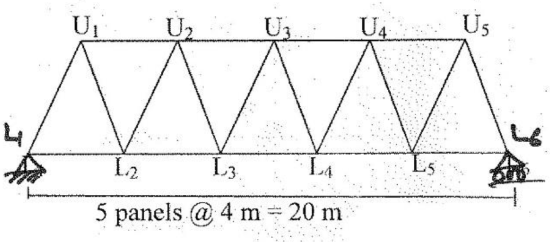

Fig - 4

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**

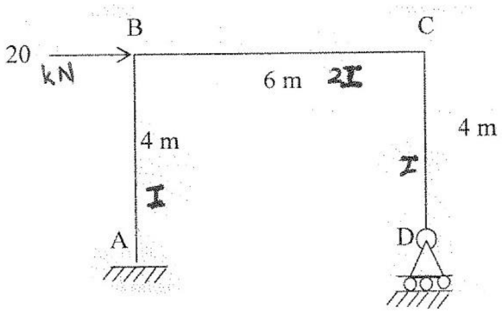

Fig. - 5

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**

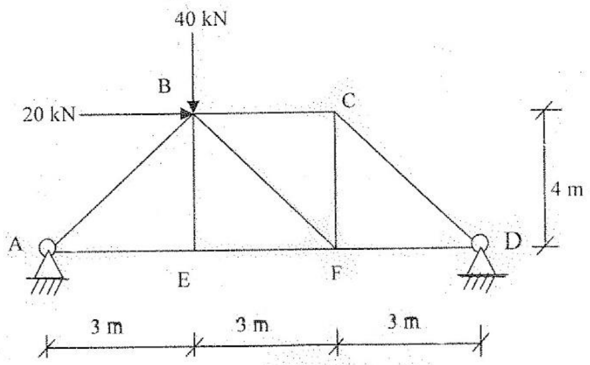

Fig. 6

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 x 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. **13**
Assume EI = 8 x 10^9 kN-mm^2

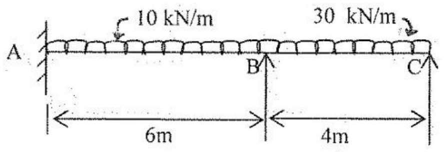

Fig. 7

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**

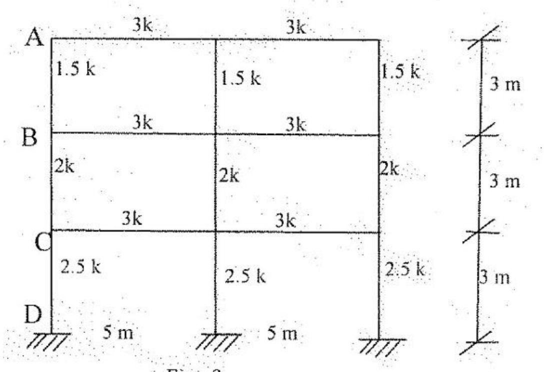

Fig - 8

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**

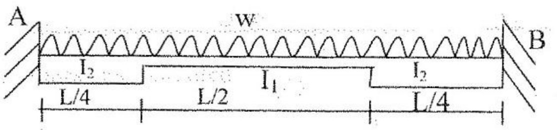

Fig - 9

OR

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

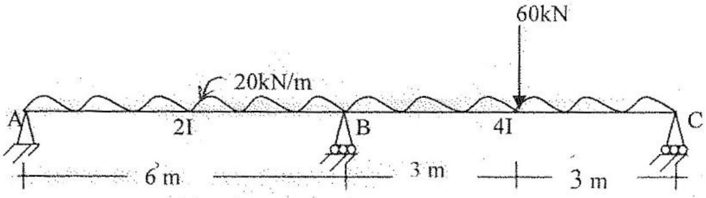

Fig - 10

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

Structural Analysis - I

P. Pages : 3 **TKN/KS/16/7351**

Time : Three Hours 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. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data wherever necessary.
10. Illustrate your answers wherever necessary with the help of neat sketches.
11. Use of non programmable calculator is permitted.

1. Analyse the continuous beam ABC shown in fig (1) and plot BMD using three moment equation. **13**

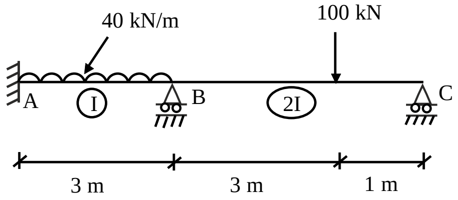


Fig. (1)

OR

2. Determine the fixed and moments developed in the beam shown in fig. (2) and plot BMD. if support B sinks down by 20mm with $E = 2 \times 10^5 \ N/mm^2$ and $I = 40 \times 10^6 \ mm^4$. **13**

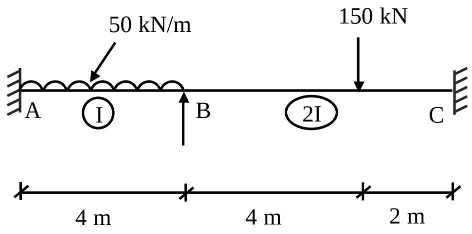


Fig. (2)

3. Four loads as shown in fig (3) are travelling over a girder of 25m span from right to left with 8kN load leading. Calculate the maximum bending moment and shear force at 7m from left support. Also calculate the v absolute maximum bending moment. **14**

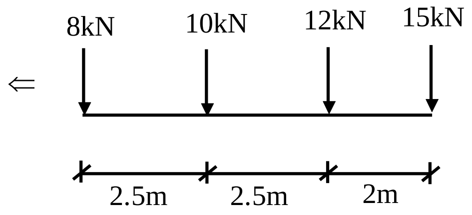
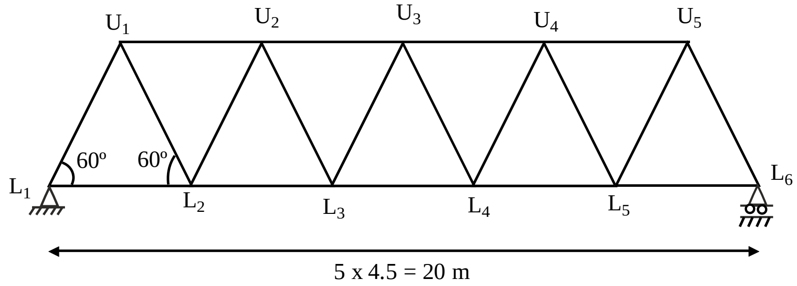


Fig. (3)

OR

4. Draw the influence line diagrams for forces in the members U_2U_3, L_3U_3, L_3L_4 and U_3L_4 of truss shown in fig(4) if uniformly distributed load of 50kN/m, longer than the span traverses along the bottom chord members. **14**



5. Analyse the frame shown in fig(5) by strain energy method and draw BMD. **13**

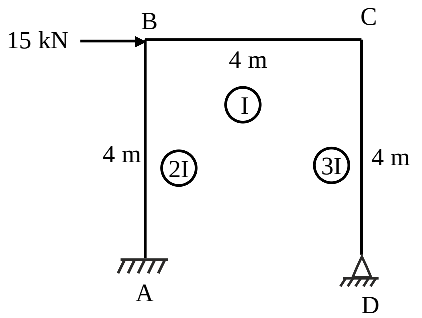


Fig. 5

OR

6. Determine the vertical deflection of Point D in the truss shown in fig(6) The cross sectional areas of members AD and DE are 1600mm^2 while those of the other members are 900mm^2. Take E = 180 kN/mm^2. **13**

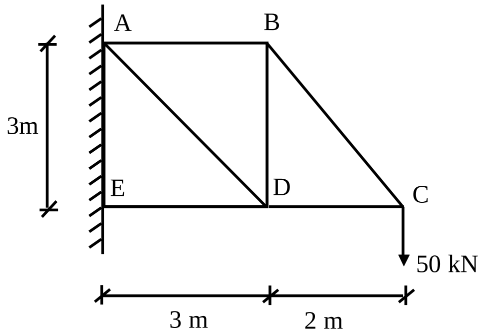


Fig. (6)

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

b) Derive from the first principle, Euler's crippling load for the column for length 'ℓ' with both end hinged. **7**

OR

8. A two hinged parabolic arch with 35m span and 8m rise is subjected to udl of 15kN/m over left half of arch. Find the reactions at supports, normal thrust and radial shear at a section 12m from left support. Take $I = I_C \sec\theta$ with usual notations. **13**

9. Analyse the portal frame shown in fig. (7) using slope deflection method and draw BMD. **14**

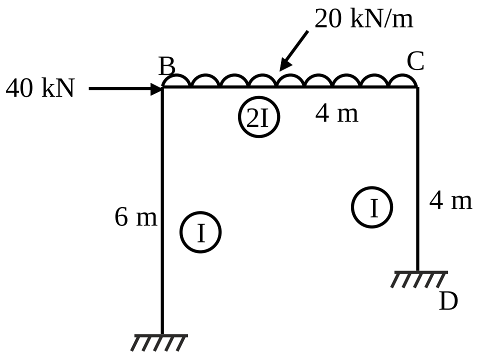


Fig. 7

OR

10. Analyse the frame shown in fig. (8) by portal frame method and draw BMD of beams and columns. **14**

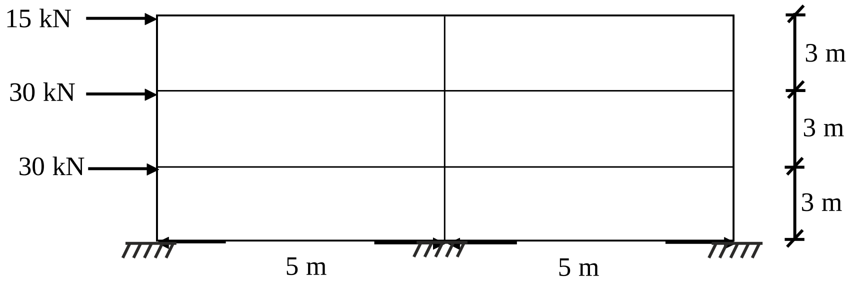


Fig. 8

11. Analyse the beam of Q. 1 shown in fig (1) using flexibility matrix method and draw BMD. **13**

OR

12. Analyse the fixed beam shown in fig (9) by Column Analogy Method. **13**

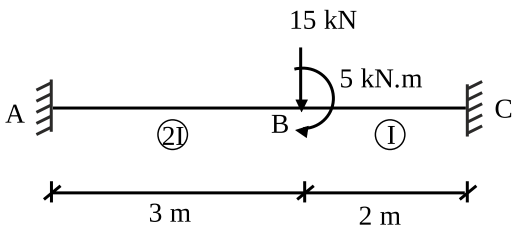


Fig. 9

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