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

Structural Analysis – II

P. Pages : 4
Time : Three Hours

NIR/KW/18/3403
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. Use of non programmable calculator is permitted.

1. Analyse the frame shown in fig. 1 by Kanis Method. Draw BMD. Take EI = Constant. **14**

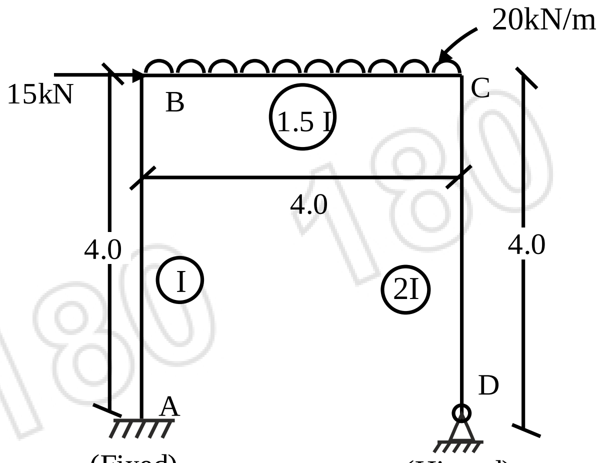


Fig. 1

OR

2. Analyse the frame shown in fig. 2 by Kanis Method. Draw BMD. **14**

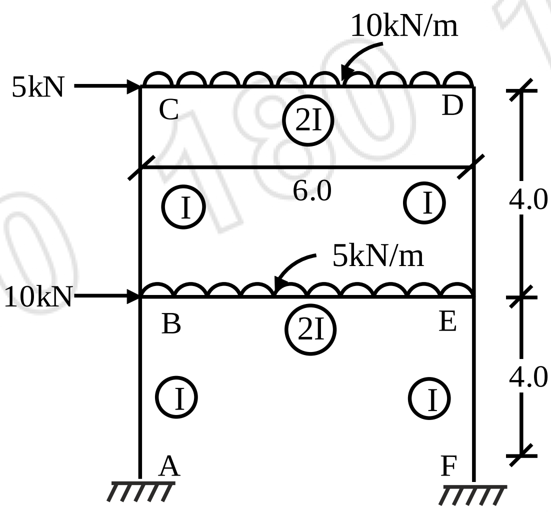


Fig. 2

3. Analyse the continuous beam shown in fig. 3 by using Moment distribution method. Draw BMD. **13**

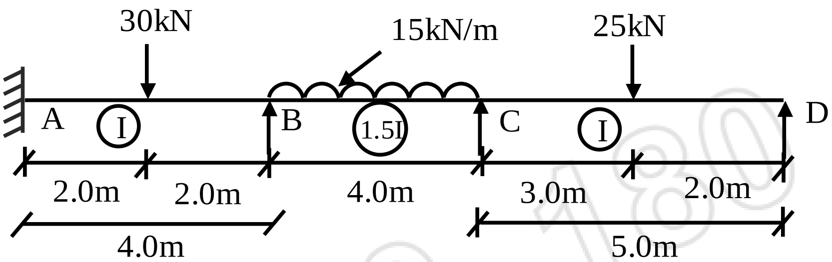


Fig. 3

OR

4. Analyse the continuous beam shown in fig. 4 by using Moment distribution method. Draw BMD. **13**

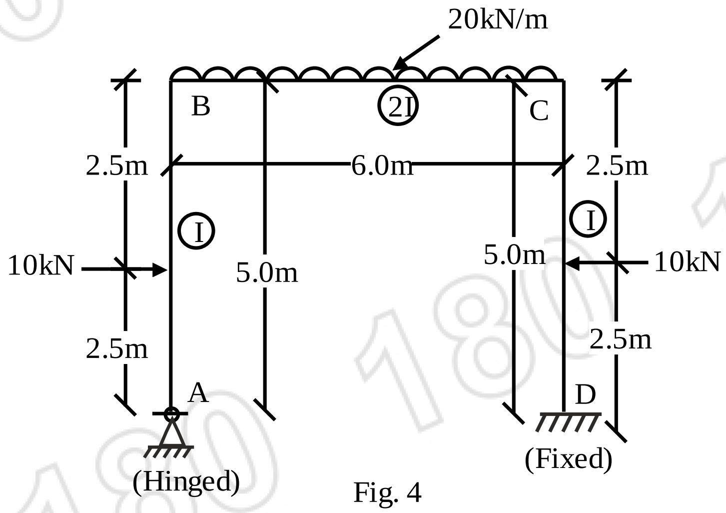


Fig. 4

5. Determine the final member forces for the truss shown in fig. 5 by stiffness method. Consider the following. **13**

(i) Increase in temperature by 50ºC in the member.

Take $\alpha = 12 \times 10^{-6} / ^{o}C$, $E = 200\,GPA, A = 500\,mm^2$ for all members.

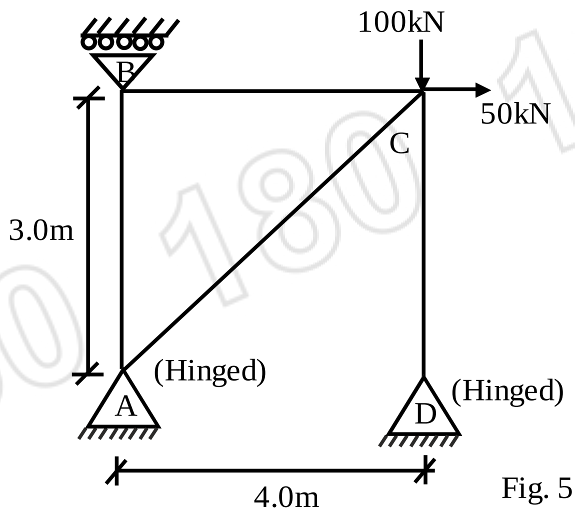


Fig. 5

OR

6. Determine the final member forces for the truss shown in fig. 6 by stiffness method. **13**

$A = 200\,mm^2$, $E = 8000\,KN/mm^2$.

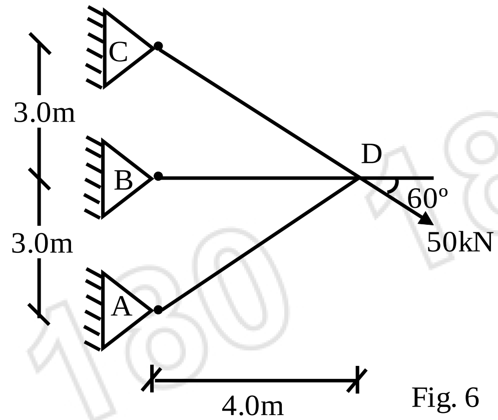


Fig. 6

7. Analyse the continuous beam shown in fig. 7 by using stiffness method. Draw BMD. **14**

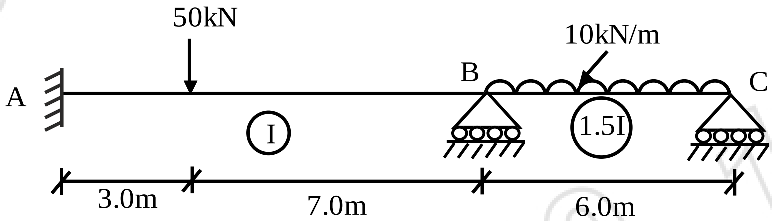


Fig. 7

OR

8. Analyse the continuous beam shown in fig. 8 by using stiffness method. Draw BMD. **14**

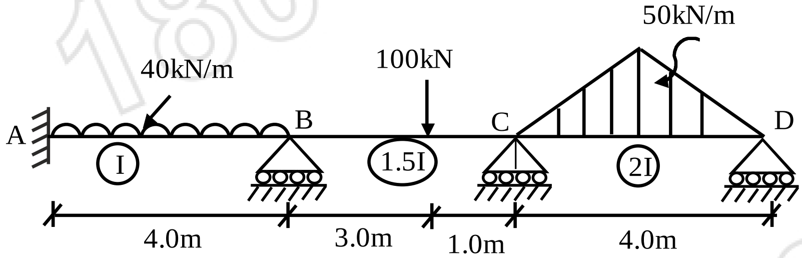


Fig. 8

9. Analyse the frame shown in fig. 9. Determine the member forces neglecting axial deformation. Draw BMD. **13**

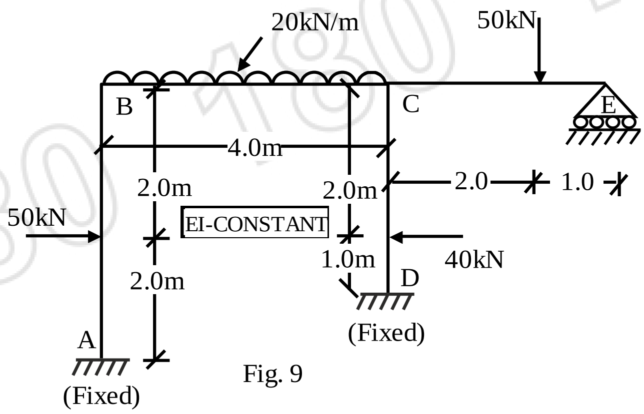
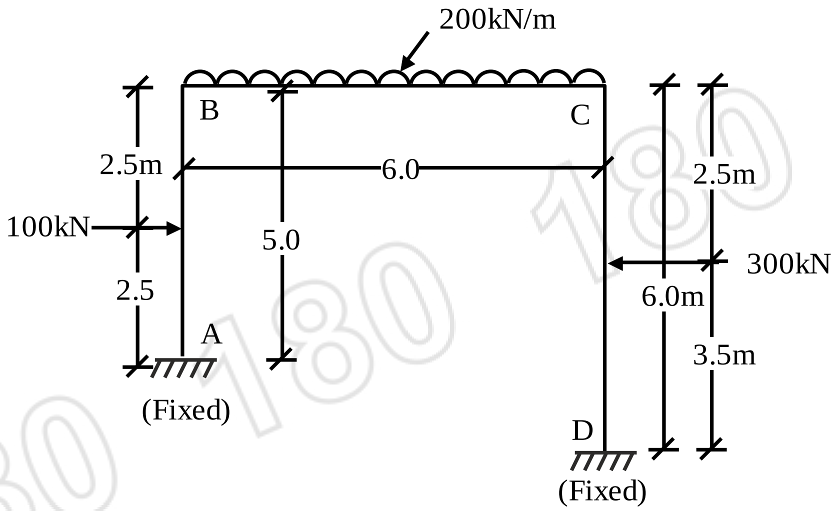


Fig. 9

OR

10. Analyse the frame shown in fig. 10. Determine the member forces neglecting axial deformation. Draw BMD. **13**



11. Write short notes **any three.** **13**

i) Natural frequency.

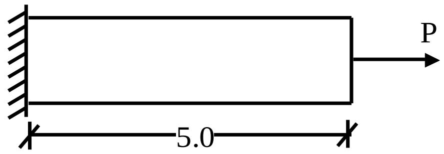
ii) Single degree of freedom system.

iii) D' Alembert principle.

iv) Damping.

OR

12. Using Rayleigh – Ritz method find displacement of the bar $U = a_1 + a_2 x$ **13**
$E = 2\times10^5 \, N/mm^2$, $A = 100\,mm^2$.



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

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P. Pages : 4 **NJR/KS/18/4458**

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10. Use of non programmable calculator is permitted.

1. Analyse the frame shown in fig. 1 using Kani's method and draw BMD. **14**

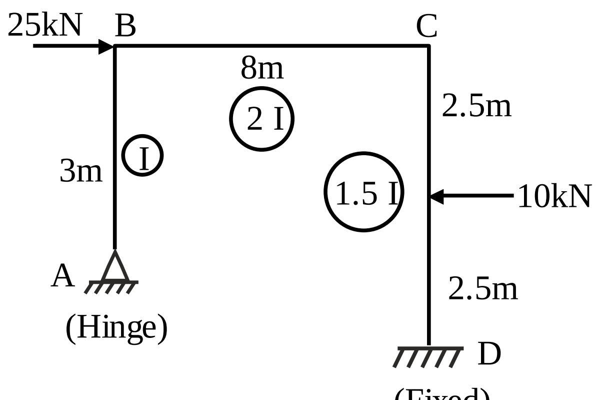

Fig. 1

OR

2. Analyse the frame shown in fig. 2 and draw its BMD. Use Kani's method. **14**

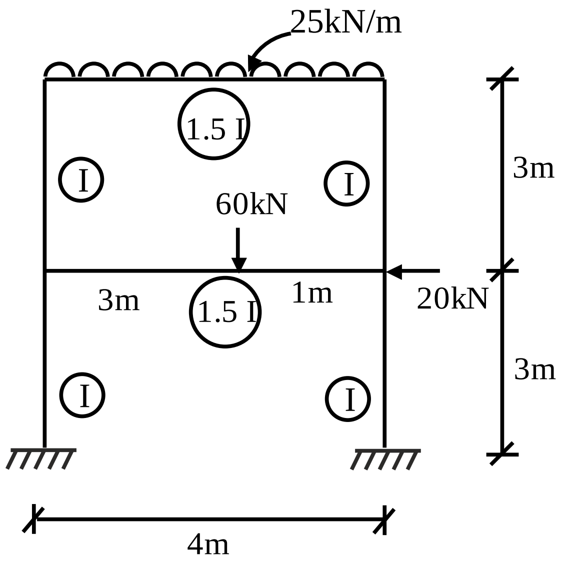

Fig.2

3. Analyse the continuous beam shown in fig. 3 by Moment distribution method. Draw BMD. **13**

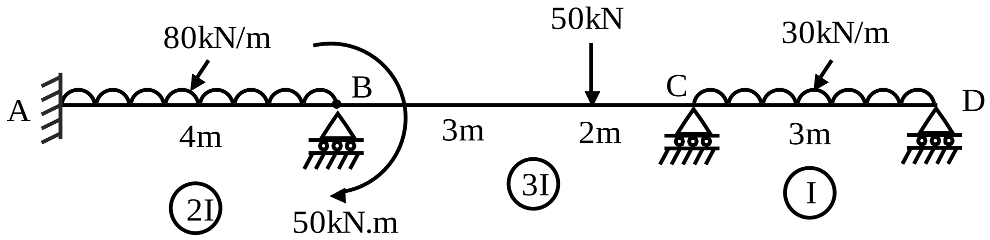

Fig. 3

4. Analyse the structure loaded as shown in fig. 4 by moment distribution method and sketch bending moment diagram. **13**

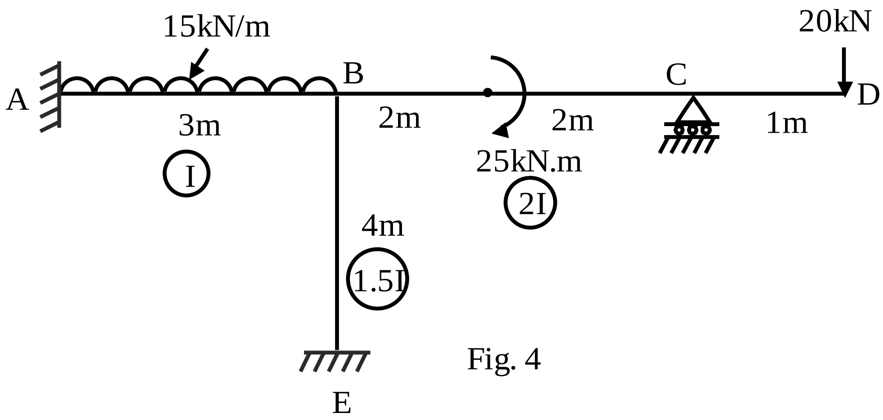

Fig. 4

5. Determine the nodal displacement and member forces for the truss shown in fig. 5. **14**

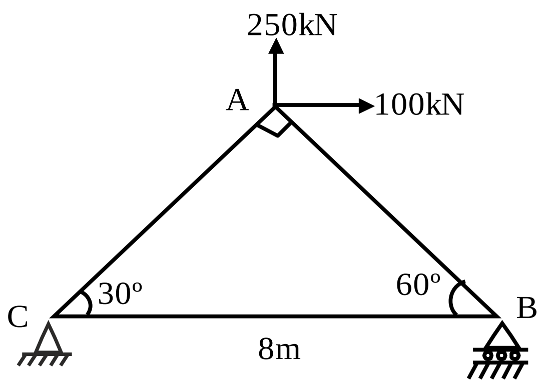

Fig.5

where,

$E = 200\ kN/mm^2$

And, cross sectional area of members

$AB = 1620\, mm^2$

$AC = 1620\, mm^2$

$BC = 1340\, mm^2$

OR

6. a) Derive the structure stiffness matrix for the prismatic plane truss element. **7**

b) Calculate the force in member, if member BD is longer than its theoretical length, e=2 mm. (Refer fig. 6). **7**

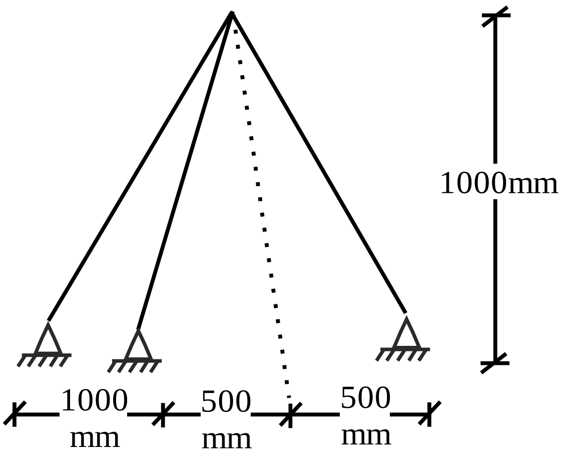

Fig.6

7. a) Derive the stiffness matrix for beam element. **4**

b) Analyse the continuous beam shown in fig. 7. Draw BMD, EI is constant. **9**

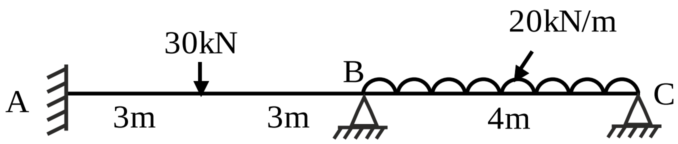

Fig. 7

OR

8. Analyse the continuous beam shown in fig. 8. Draw B.M.D, EI is constant. **13**

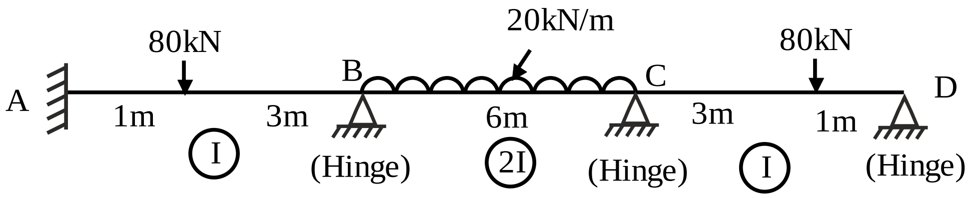

Fig. 8

9. Determine the Global stiffness matrix as shown in fig. 9 taking size of member as 30x50 cm and $E = 25.5 \times 10^6 kN/m^2$. **13**

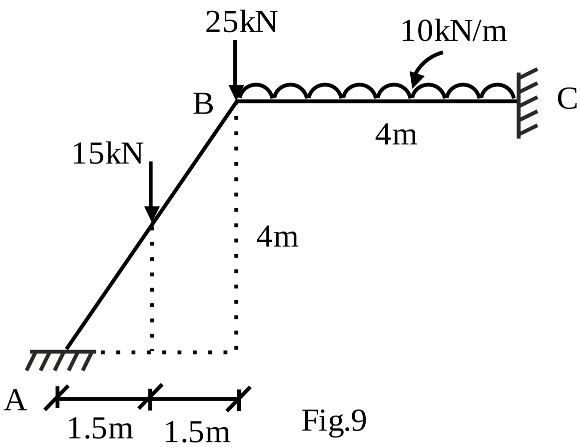

Fig.9

OR

10. Find total joint load vector for the rigid frame shown in fig. 10. Neglect Axial deformation. (Note : udl is continuous on span AB and BC). **13**

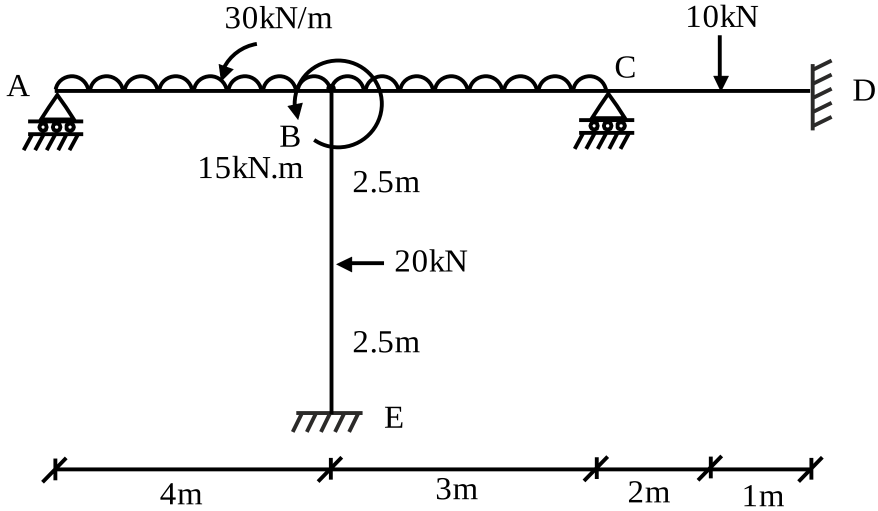

Fig. 10

11. a) Model the system as damped single degree of freedom system and describe the elements involved in it. **6**

b) A cantilever beam 2.5m long supports a mass of 500 kg at its free end. Find the natural period and natural frequency of vibration. **7**
Take $E = 2.1 \times 10^6 \, kg/cm^2$ and $I = 1300 \, cm^4$.

OR

12. Using principle of minimum potential energy, find out tip displacement for the tapered bar shown in fig. 11. Cross sectional area of the bar at A_1 is 450 mm^2 and at A_2 is 250 mm^2. Take $E = 2 \times 10^5 \, N/mm^2$. **13**

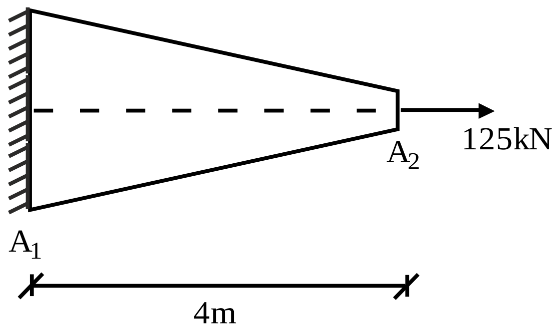

Fig.11

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

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P. Pages : 4 **NRJ/KW/17/4458**

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7. Solve Question 11 OR Questions No. 12.
8. Assume suitable data whenever necessary.
9. Use of non programmable calculator is permitted.

1. Analyse the frame shown in fig 1 by Kani's method. Draw BMD. Take EI = constant. **14**

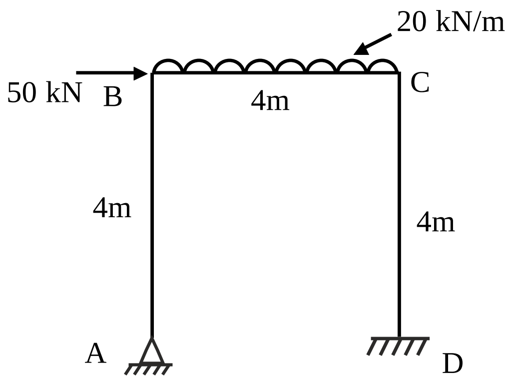


Fig. 1

OR

2. Analyse the frame showing fig. 2 by Kani's method and draw BMD. **14**

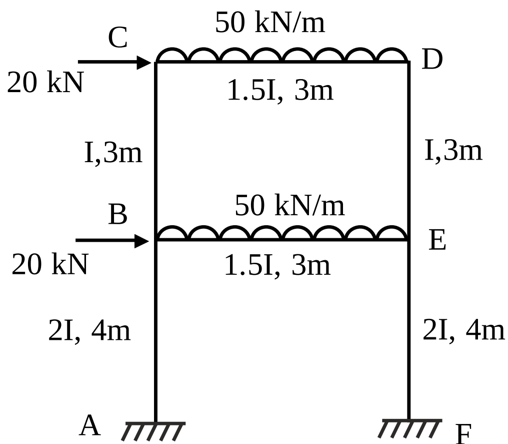


Fig. 2

3. Analyse the continuous beam by moment distribution method taking EI as constant. Also draw BMD. Refer fig. 3. **13**

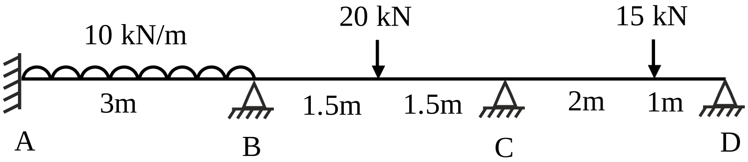


Fig. 3

OR

4. Analyse the frame by moment distribution method as shown in fig. 4. Draw BMD. **13**

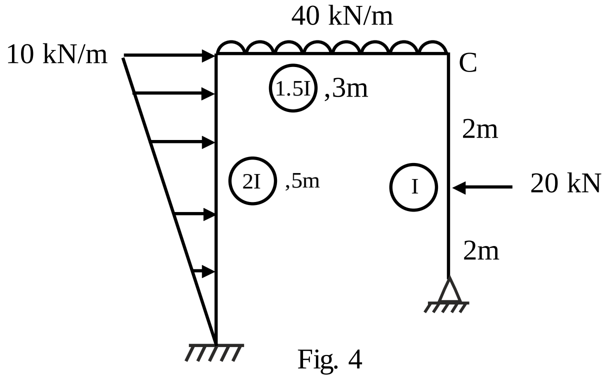
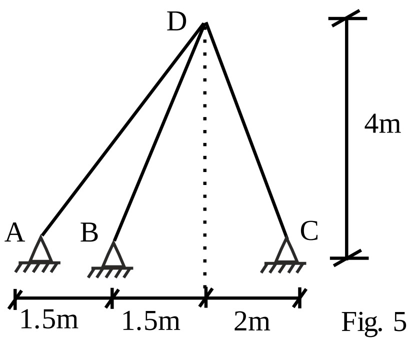


Fig. 4

5. a) Derive stiffness matrix for truss elements. **5**

b) Determine member forces in given truss by stiffness method. **9**



$E = 8000\ kN / cm^2$
$A = 6\ cm^2$
for all members

Fig. 5

OR

6. Analyse the truss as shown in fig. 6. by stiffness method if the temperature is raised by 30ºC. Take E = 210 GPa, $A = 750\,mm^2$. **14**

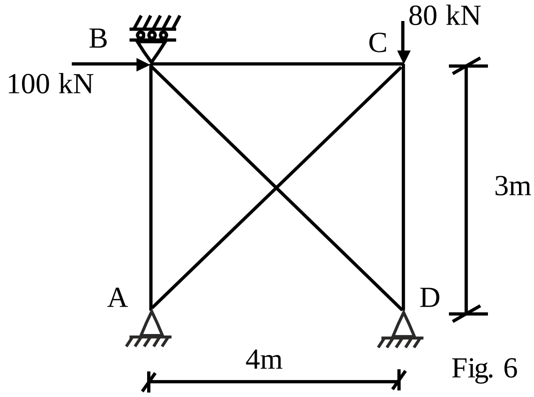


Fig. 6

7. a) Derive stiffness matrix for beam element. **4**

b) Analyse continuous beam by stiffness method in fig. 7. Draw SFD and BMD. **9**

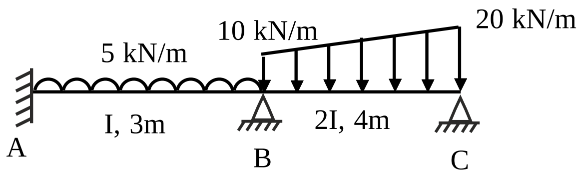


Fig. 7

OR

8. Analyse continuous beam as shown in fig. 8. Draw BMD by taking EI = constant. **13**

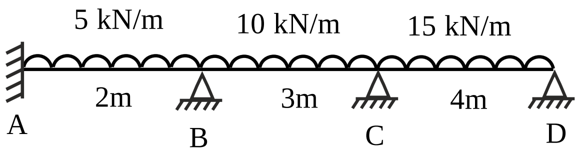


Fig. 8

9. a) Derive stiffness matrix for plane frame element by basic principle. **5**

b) Assemble global stiffness matrix of frame shown in fig. 9. **8**

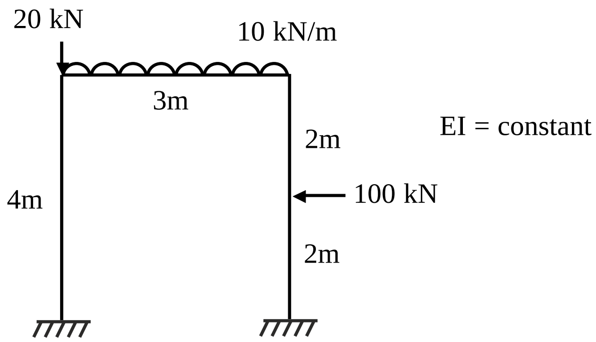


Fig. 9

OR

10. Analyse the frame by stiffness method. Refer fig. 10. **13**

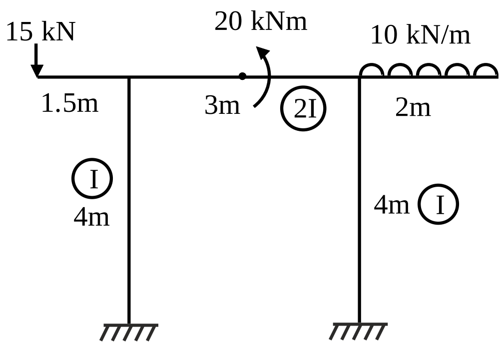


Fig. 10

11. Define **any three.** **13**

a) Natural Frequency

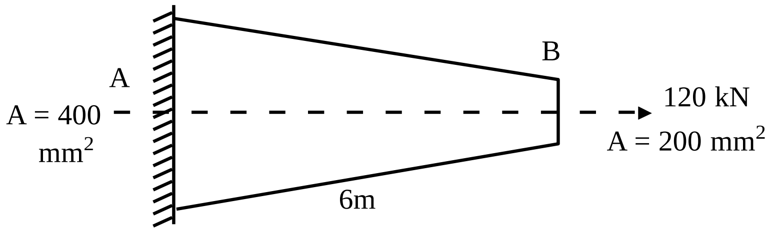
b) Single Degree of freedom.

c) D'Alembert principle

d) Damping

OR

12. Using principle of minimum potential energy. Find out tip displacement for tapered bar as in fig. 11. Take $E = 2 \times 10^5$ MPa . **13**



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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. Analyse the frame shown in fig. 1 by Kani's method and draw B.M.D. **14**

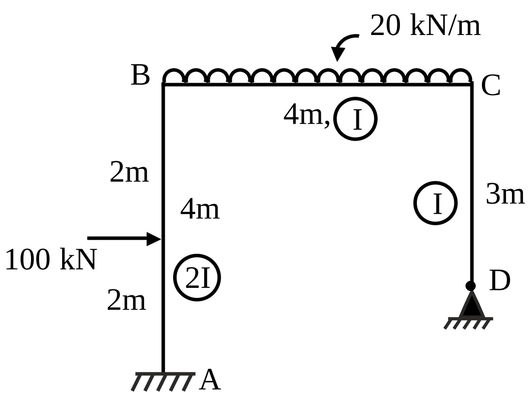

Fig.1

OR

2. Using Kani's method, analyse the portal frame shown in fig. 2. **14**

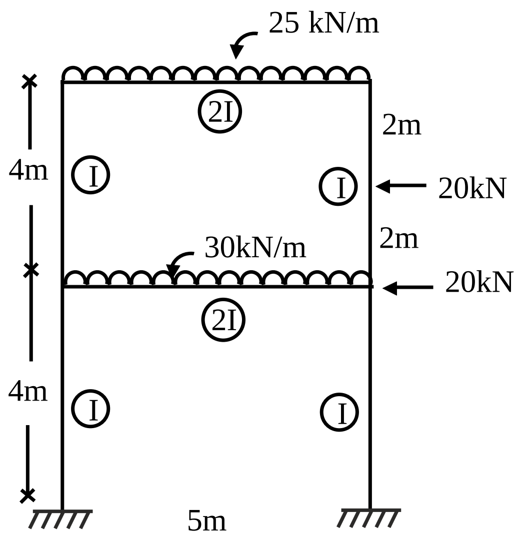

Fig.2

3. Analyse the continuous beam shown in fig. 3 by moment distribution method and draw BMD. **13**

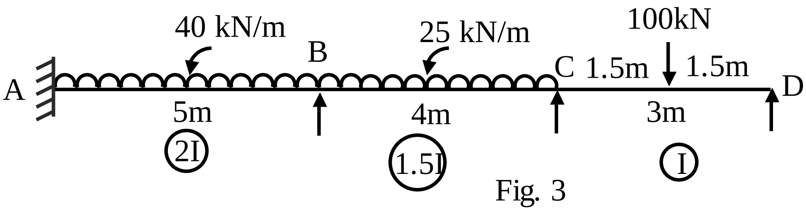

Fig. 3

OR

4. Using moment distribution method, analyse the frame shown in fig. 4. **13**

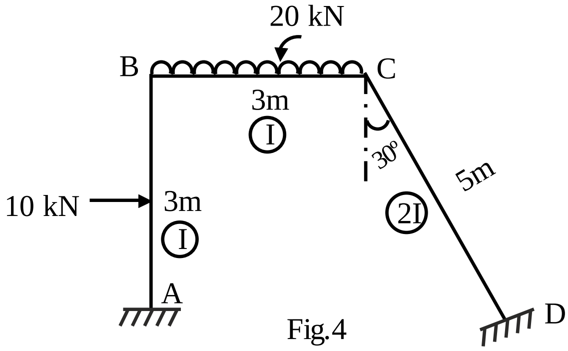

Fig.4

5. Determine the nodal displacement matrix for the plane truss shown in Fig. 5. Use direct stiffness method. Take area of members as $800\,mm^2$ and $E = 200\ kN/mm^2$ **13**

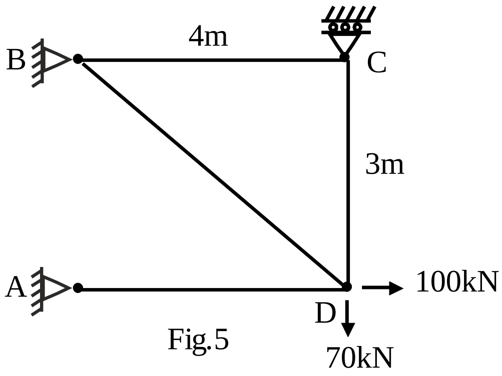

Fig.5

OR

6. Assemble the global stiffness matrix for the plane truss shown in fig. 6 Also assemble the load vector if c/s area for all members in 1000 mm^2 and E = 210 GPa. **13**

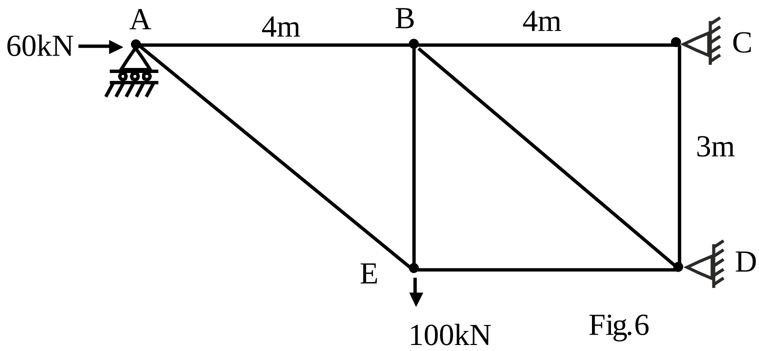

Fig.6

7. Using stiffness method, analyse the continuous beam shown in fig. 7 and draw its BMD. **13**

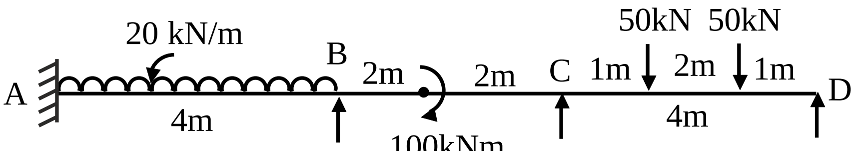

Fig. 7

Take flexural rigidity uniform.

OR

8. Derive an elemental stiffness matrix and rotational transformation matrix for plane beam element. **13**

9. Analyse the plane frame shown in fig. 8 by stiffness method. Take $E = 25.5 \times 10^6\ \text{kN}/\text{m}^2$, size of member 230 x 450mm. **14**

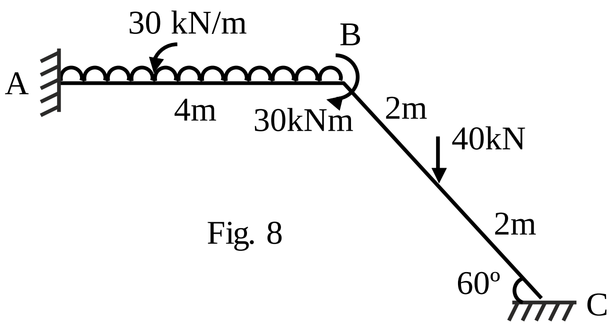

Fig. 8

OR

10. Derive the member force vectors for the plane frame shown in fig. 9. Take $E = 25 \times 10^3 \dfrac{N}{mm^2}$ and member cross-section as 200 x 400 mm. Use stiffness method and neglect axial deformaton. **14**

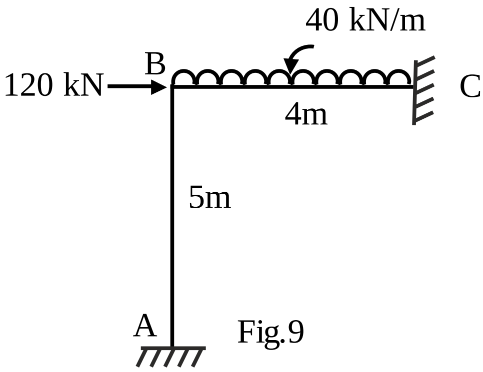

Fig.9

11. Using principle of minimum potential energy find out tip displacement for the tapered bar shown in fig. 10. Cross sectional area of the bar at A is 400mm^2 and at B is 200mm^2. Take $E = 2 \times 10^5 \, N/mm^2$ **13**

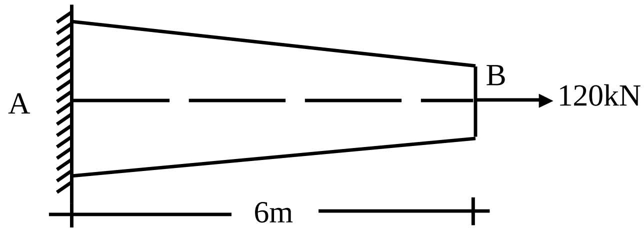

Fig.10

OR

12. a) Define **any three.** **6**

i) Free vibration, ii) Forced vibration,

iii) Natural frequency, iv) Period of vibration

b) A 0.5 kg mass attached at the end of a light spring elongates it by 1.5mm. Find the stiffness and natural frequency of the system. **7**

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

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1. Analyse the frame shown in fig. (1) by Kanis Method and draw B. M. diagram. **14**

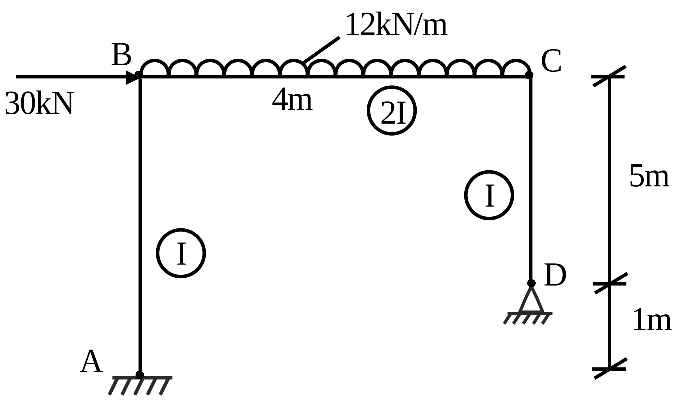


Fig. 1

OR

2. Analyse the frame shown in fig. (02) by Kanis method and draw B. M. diagram. **14**

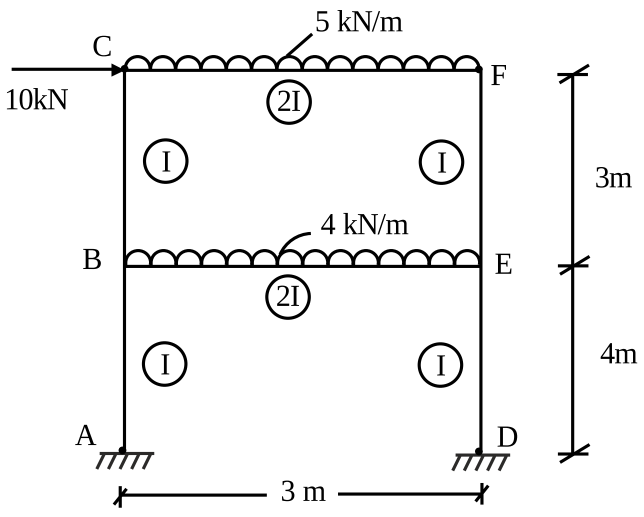
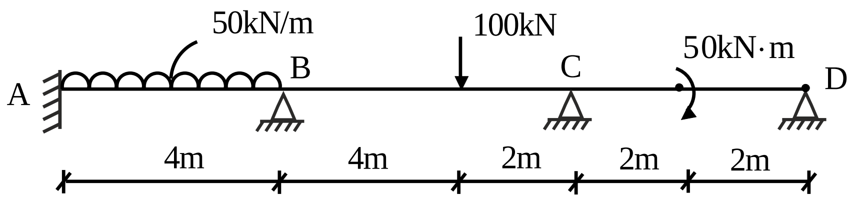


Fig. 2

3. Analyse the continuous beam by moment distribution method shown in fig. (3) and draw BMD. **13**



EI - Constant Fig. 3

OR

4. Analyse the frame by moment distribution method shown in fig. (04) and draw BMD. **13**

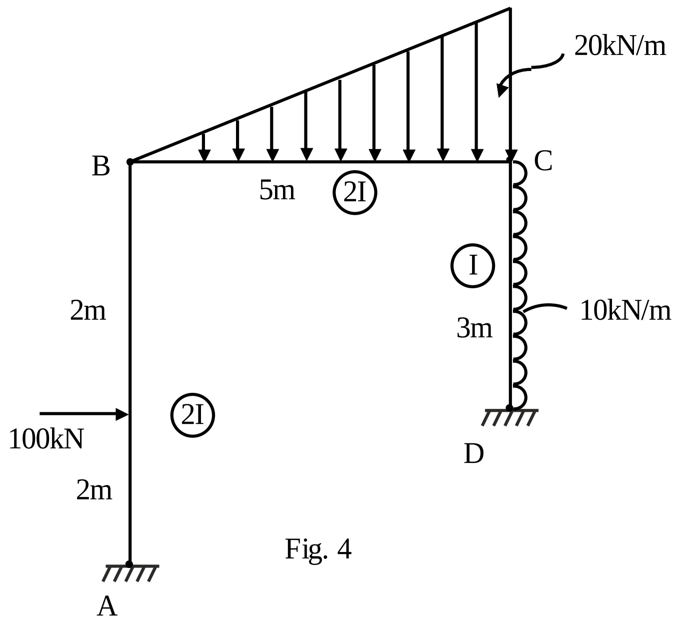
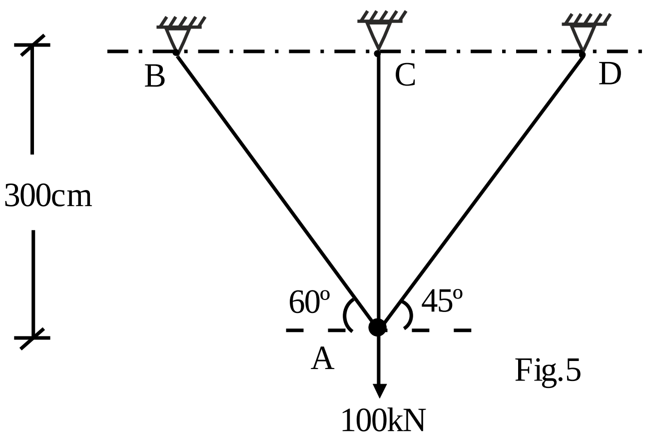


Fig. 4

5. a) Derive the stiffness matrix for Truss element. **4**

b) Determine the forces in member of given truss shown in fig. (05) **10**



$E_{AB} = E_{AD} = 8000\ kN/cm^2$

$E_{AC} = 2000\ kN/cm^2$

Area of each member $6\ cm^2$

Fig.5

OR

6. Analyse the truss shown in fig. (6) If temp. is increased by 30º, Also the length of member AC is found to be 5mm too short, $\alpha = 12 \times 10^{-6} / {}^{o}C$ **14**

E = 210 GPa, Area of $c/s = 750\,mm^2$

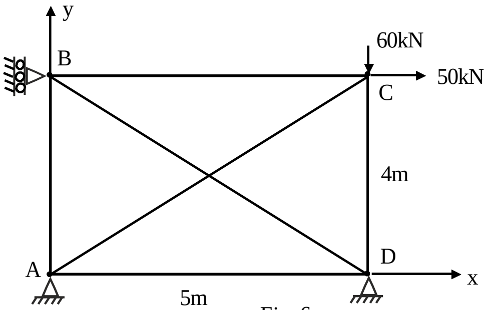


Fig. 6

7. a) Derive the stiffness matrix for beam element. **4**

b) Analyse the continuous beam shown in fig. (07) Draw SFD and BMD, EI is constant. **9**

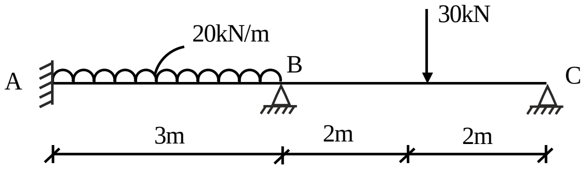


Fig. 7

OR

8. Analyse the continuous beam shown in fig. 8. Draw B.M.D. Take EI = 1 unit (Note : udl is continuous on span AB, BC & CD) **13**

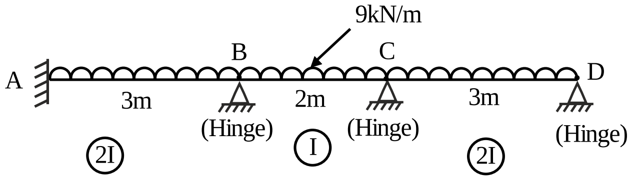


Fig. 8

9. a) Derive stiffness matrix for a plane frame element from basic principle. **5**

b) Find the global load vector of the rigid jointed frame shown in fig. 9 (b). Take external temp. = 20ºC, Internal temp. = 50ºC, $\alpha = 1 \times 10^{-5} / {}^{\circ}C$ $E = 2.54 \times 10^{7}\ kN/m^2$.
Size of column = 230 x 500 mm, size of beam = 230 x 650 mm.

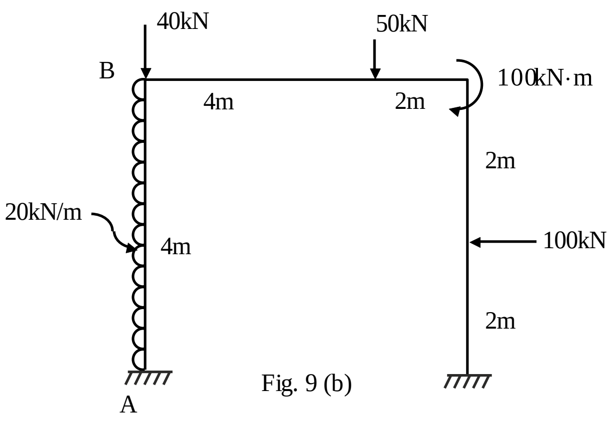


Fig. 9 (b)

OR

10. Find total Joint load vector for rigid frame shown in fig. (10) Neglect axial deformation. **13**

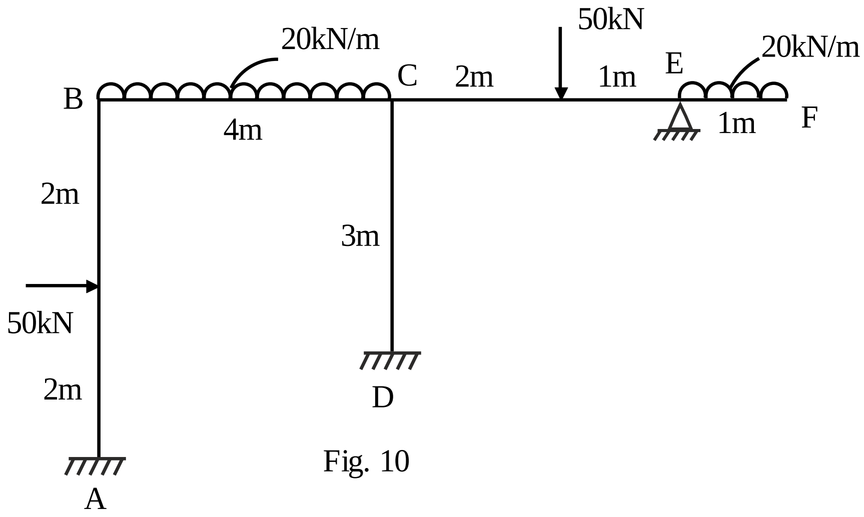


Fig. 10

11. Derive Displacement, stress, strain at Nodes of a three nodded bar as shown in fig. (11) Analyse as one dimensional problem Area of element $A(x) = A_o\, e^{(-x/26)}$ **13**

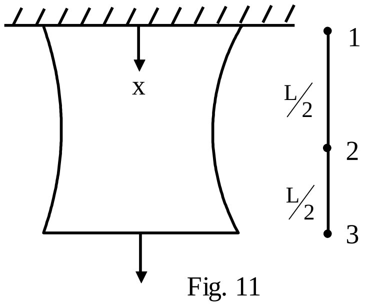


Fig. 11

OR

12. Write short notes on **any three.** **13**

a) Natural frequency.

b) Single degree of freedom system.

c) 'D' Alembert principle.

d) Damping.

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

Structural Analysis - II

P. Pages : 4 **TKN/KS/16/7406**

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. Use of non programmable calculator is permitted.

1. Analyse the frame shown in fig : 1 using Kani's method and draw its BMD. **14**

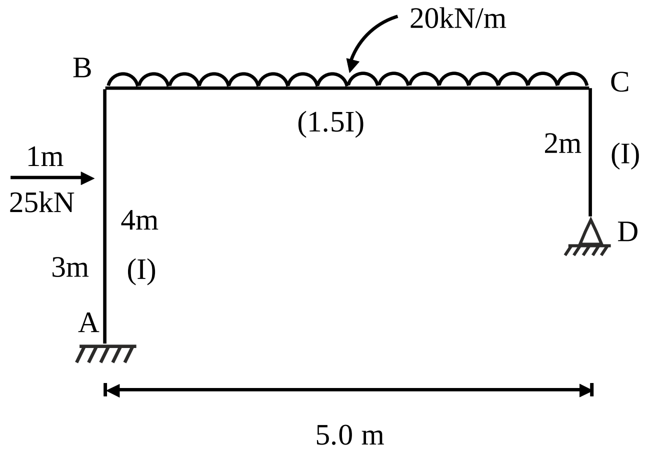

Fig:1

OR

2. Analyse the frame shown in fig : 2 and draw its BMD. Use Kani's method. **14**

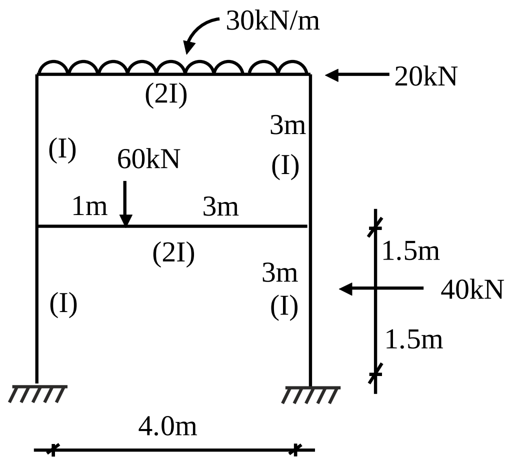

Fig:2

3. A beam is loaded as shown in fig : 3. Plot the bending moment diagram if the support A settles by 10 mm, B settles by 20 mm and C settles by 15 mm. Take $EI = 5100\,kN.m^2$. Use MDM. **13**

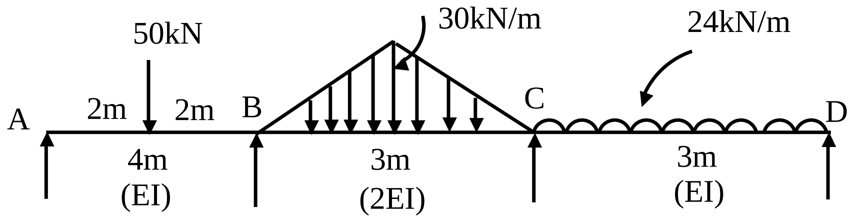

Fig:3

OR

4. Analyse the structure loaded as shown in fig : 4 by the moment distribution method and sketch bending moment. **13**

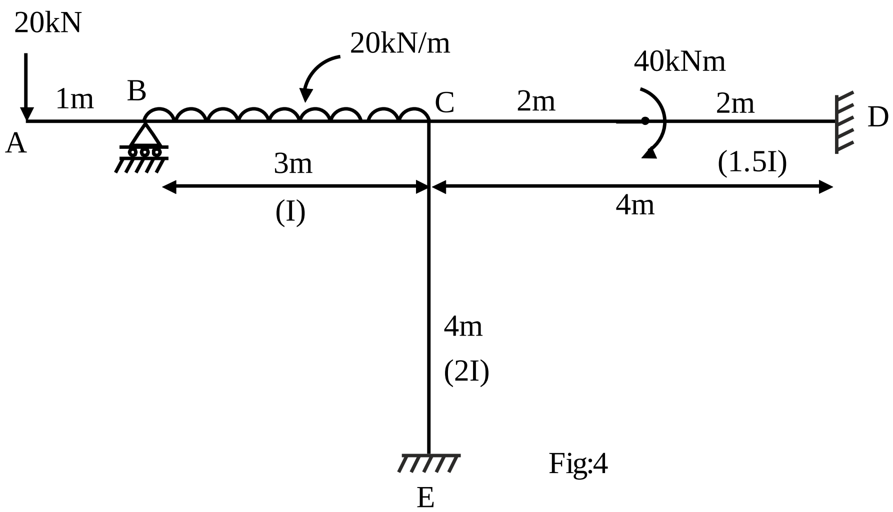

Fig:4

5. Find member forces for the plane truss shown in fig : 5. Member BC is too long by 3 mm. Use stiffness method. c/s area of all members is $600 mm^2$. Assume E = 200 GPa. **14**

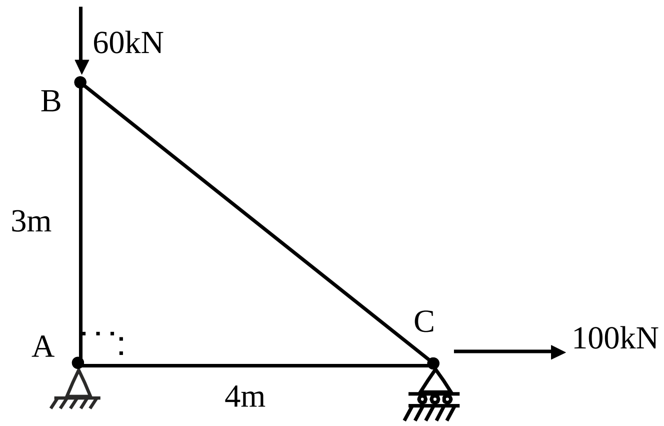

Fig:5

OR

6. Assemble the global stiffness matrix and load matrix for the plane Truss shown in fig : 6 if members meeting at joint B are subjected to temperature rise of 60ºC. Assume $E = 210\,kN/mm^2$. C/S area of members **14**

$AB = BC = CD = 710\,mm^2$ &

$AC = BD = 550\,mm^2$.

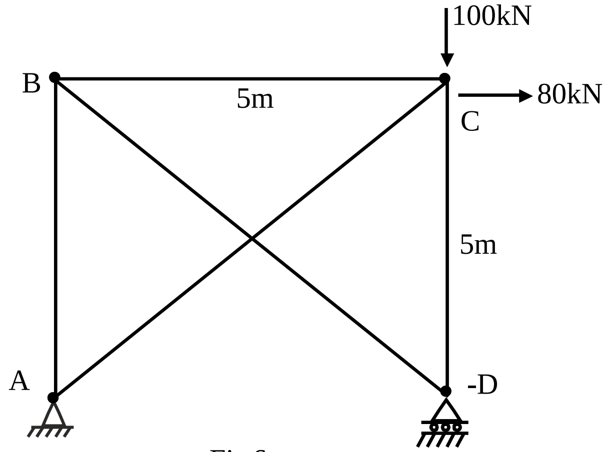

Fig:6

7. a) Derive member stiffness matrix for a prismatic plane beam element. **7**

b) Derive rotation transformation matrix for a plane beam element. **6**

OR

8. Assemble global displacement matrix for the plane beam loaded as shown in fig : 7 using stiffness method. **13**

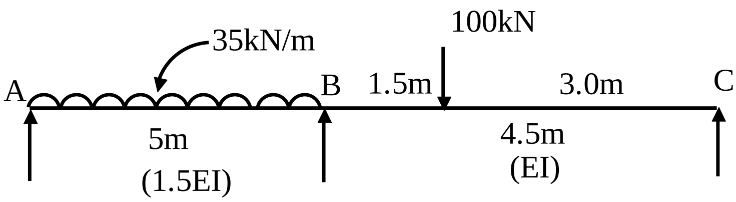

Fig:7

9. Analyse the plane frame shown in fig : 8 and draw its BMD neglecting axial deformations. Use stiffness method. **13**

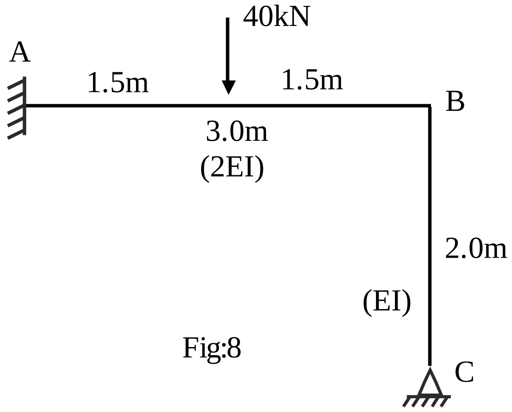

Fig:8

OR

10. Using stiffness method, analyse the rigid jointed plane frame shown in fig : 9. Assume uniform flexural rigidity for all members as EI. Neglect axial deformations. **13**

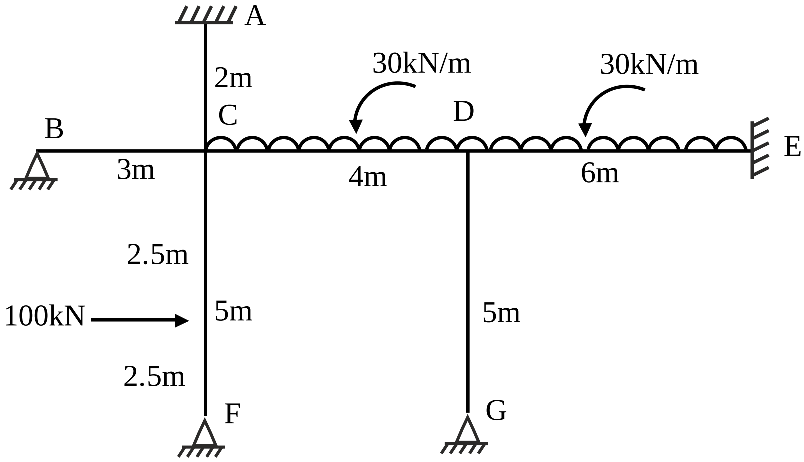

Fig:9

11. a) Derive an equation of motion for an undamped single degree of freedom system for free vibration. **6**

b) A cantilever beam 3 m long supports a mass of 500 kg at its free end find the natural period and natural frequency of vibration. Take $E = 2.1 \times 10^6 \, kg/cm^2$ and $I = 1300 \, cm^4$. **7**

OR

12. Using finite element method, derive the displacement matrix. Also find member strain and stress, for the steel specimen shown in fig. 10. **13**

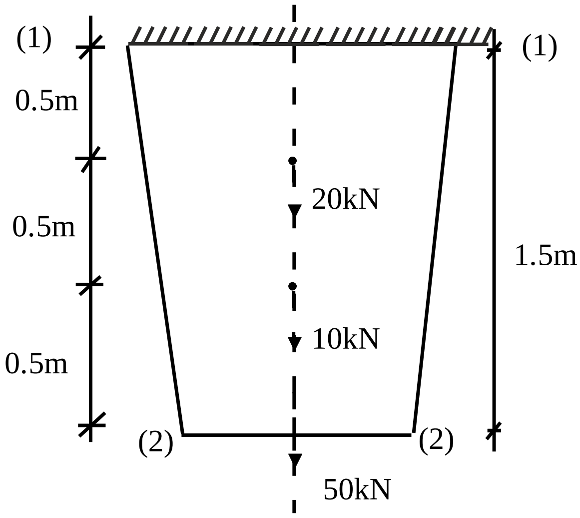

Fig:10

$^C\!/_S$ area at $(1)-(1)$ is equal to $= 425 \, mm^2$

$^C\!/_S$ area at $(2)-(2)$ is equal to $= 125 \, mm^2$.

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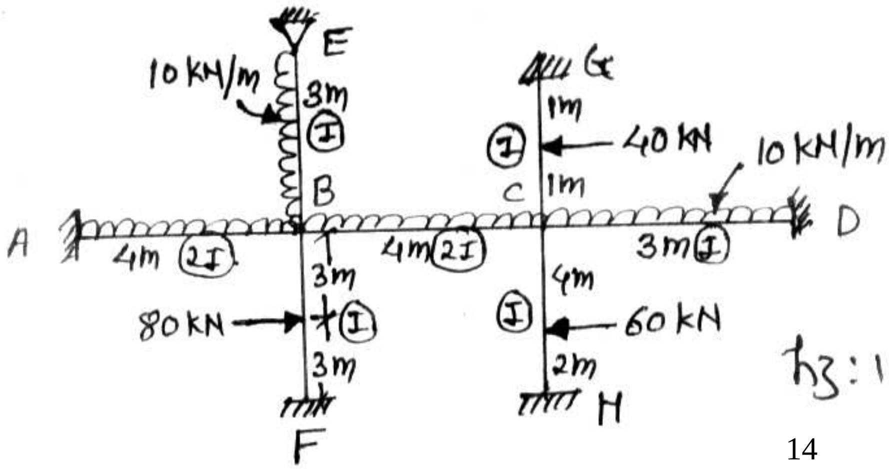
Fifth Semester B. E. (Civil Engg.) (CBS) Examination

STRUCTURAL ANALYSIS–II

Time : Three Hours] [Max. Marks : 80

N. B. :
(1) All questions carry marks as indicated.
(2) Due credit will be given to neatness and adequate dimensions.
(3) Assume suitable data wherever necessary.
(4) Illustrate your answers wherever necessary with the help of neat sketches.
(5) All questions are compulsory.
(6) Use of non–programmable pocket calculator is permitted.

1. Analyse the frame loaded as shown in fig. 1 by Kani's method and sketch the bending moment diagram.



14

OR

2. Analyse the frame loaded as shown in fig.2 by Kani's method and sketch the bending moment diagram.

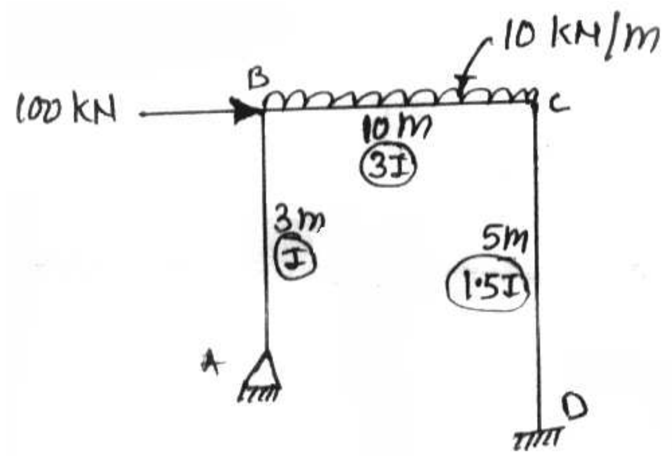


fig : 2

14

3. For continuous beam as shown in fig 3 determine support moment by moment distribution method and draw SFD and BMD.

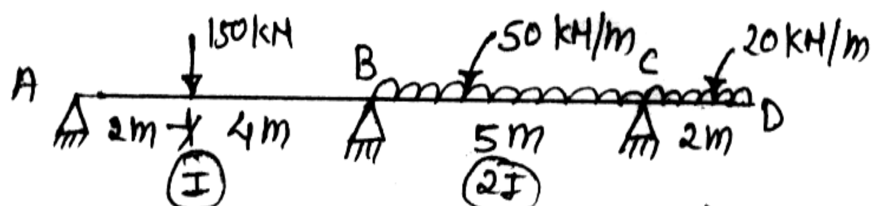
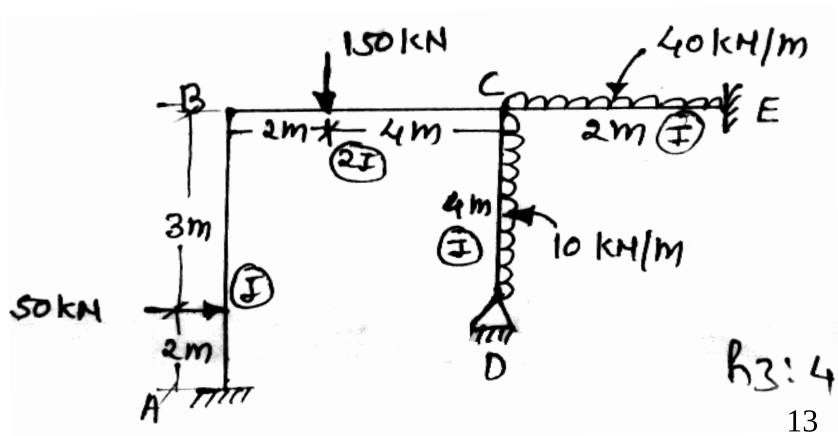


fig : 3

13

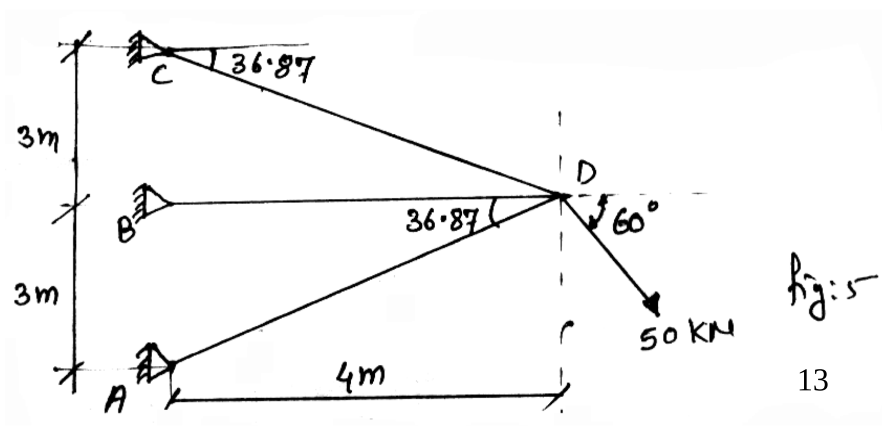
OR

4. Analyse given portal frame by moment distribution method and draw bending moment diagram refer fig.4



13

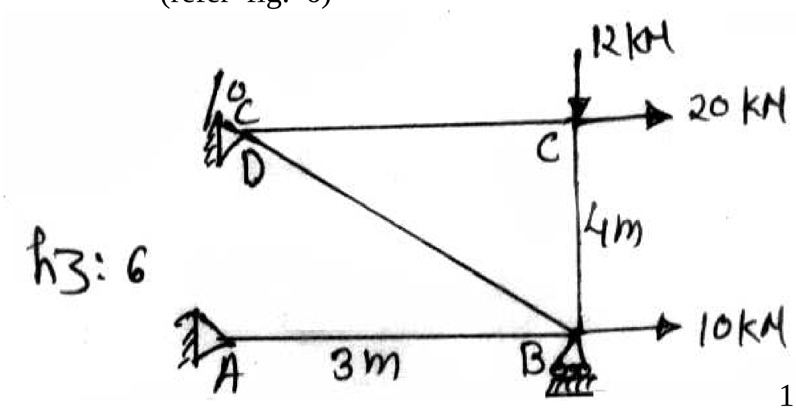
5. For the truss as shown in fig.5 determine the joint displacement and the member forcess by stiffness method Assume E = 200 kN/mm^2
A = 500 mm^2(For all member)



13

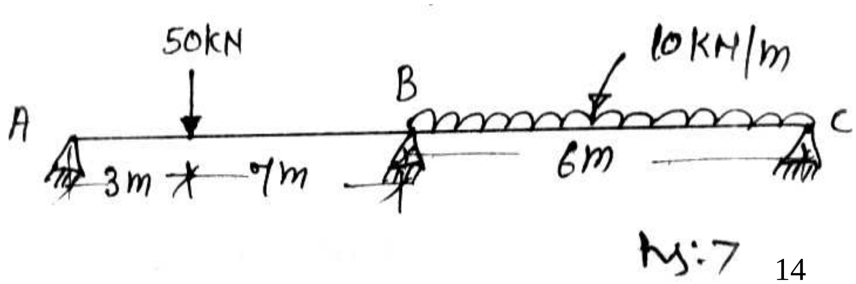
OR

6. Determine Global load matrix and stiffness matrix in given truss for the following effects,
   (1) Temp fall by 50^{0}C,
   (2) Member BD is 0.1 mm too long.
   (3) Here c/s area of each members is 10 cm^2. Assume
   E = 20000 kN/cm^2
   $\alpha = 12 \times 10^{-6}/^{0}C$
   (refer fig. 6)



13

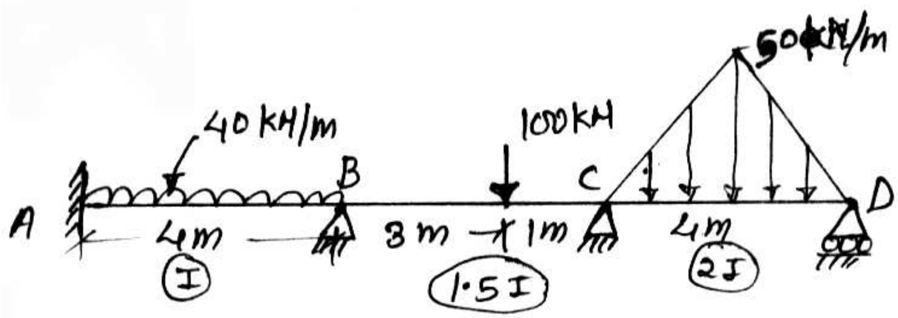
7. Analyse the given continuos beam using stiffness matrix method and plot SFD and BMD. Take EI constant.



14

OR

8. For given continous beam calculate Global stiffness matrix and Global load matrix.



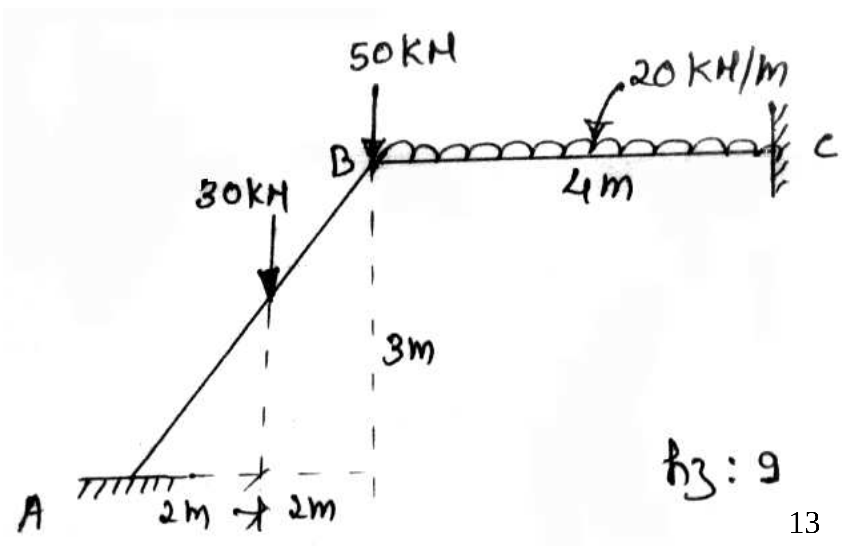
R3 : 8 14

9. Derive member stiffness matrix for a plane frame element. 13

OR

10. Determine the Global stiffness matrix as shown in fig. 9 taking size of member as
30×50 cm and $E = 25.5 \times 10^{6} kN/m^{2}$

[Fig. On Next page]

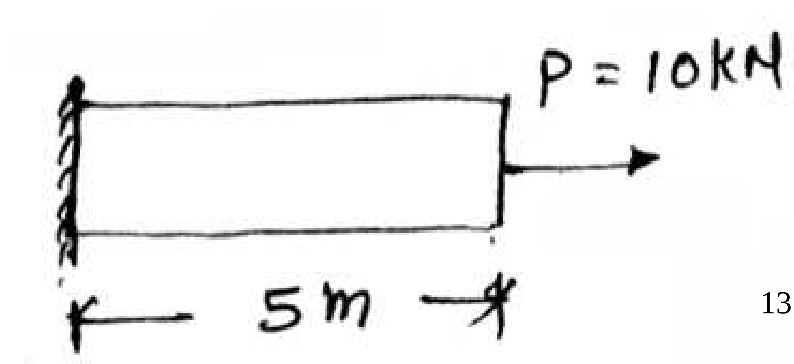


13

11. Using Rayleigh–Ritz method find displacement of the bar shown in fig. Assume $u = a_1 + a_2x$

$A = 100 \ mm^2$

$E = 2 \times 10^5 \ N/mm^2$



13

OR

12. Explain the following terms in detail (any **three**) :—

(i) D'Alembert Principle,

(ii) Inertia force,

(iii) Equation of motion,

(iv) SDOF system. 13