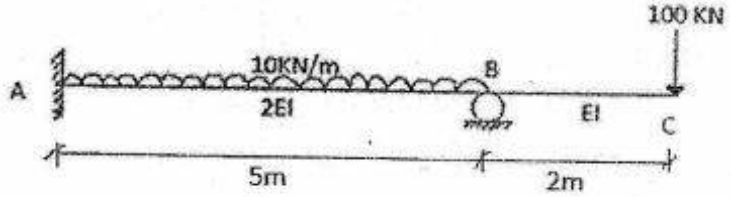
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2083 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE 601)*

- ✓ *Candidates are required to give their answers in their own words as far as practicable.*
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

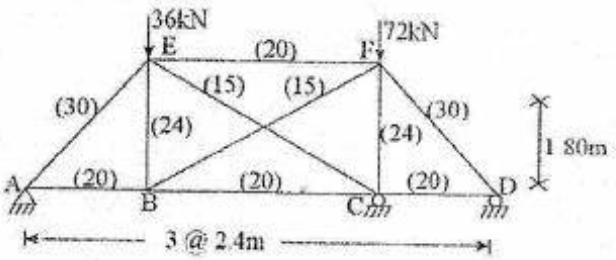
1. a) Determine the slope at B and deflection at C of the given continuous beam using Castigliano's theorem. [10]



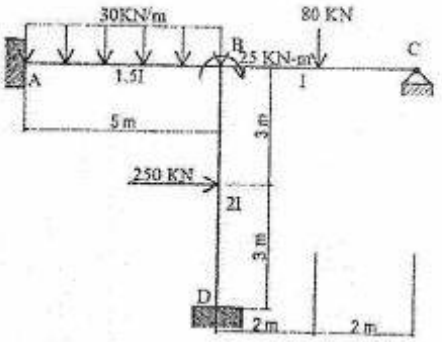
b) Derive an expression for three moment equation for continuous beam. [6]

2. a) With system of equations, describe flexibility matrix method. [4]

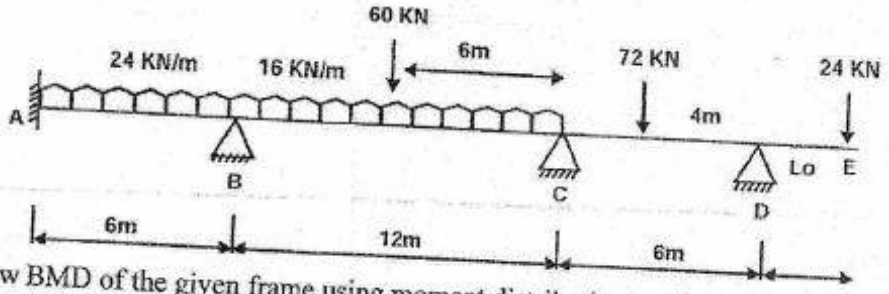
b) Compute the bar forces of all members of the given truss. Member BF is 2 mm too short and experience 20°C increase in temperature. Values in the parentheses are sectional areas in cm^2. E = 200GPa and $\alpha = 25\times10^{-6}/^0C$. [12]



3. Analyze and draw BMD of the given frame using stiffness matrix method. [12]

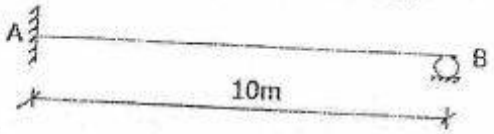


4. a) Use slope deflection method to analyze the beam shown below if support B lift up by 215/EI. [10]

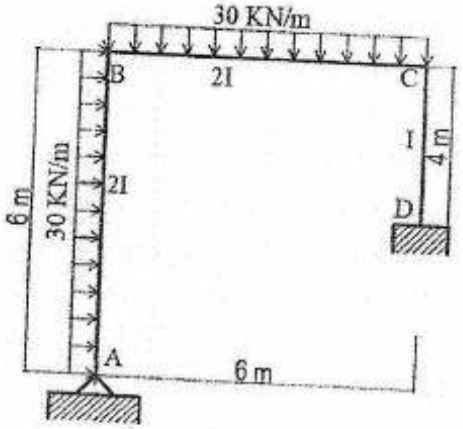


b) Draw BMD of the given frame using moment distribution method.

5. a) Draw ILD for moment reaction at length 3 m from support A of the given propped cantilever beam. Take the ordinates at an interval of 2 m. [10]



b) Determine the plastic moment capacity of the frame shown below. [6]



[10]

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TRIBHUVAN UNIVERSITY
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2082 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
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Year / Part	III/ I	Time	3 hrs.

Subject: - Theory of Structure II *(CE 601)*

- ✓ *Candidates are required to give their answers in their own words as far as practicable*
- ✓ *Attempt **All** questions.*
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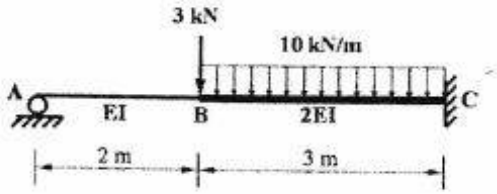
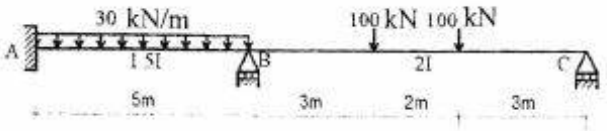
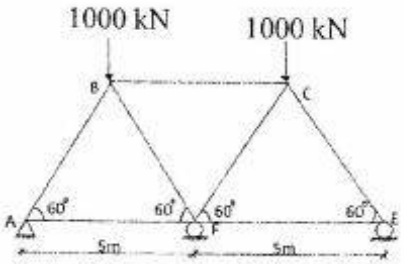
1. a) Determine reaction and slope at A using Castigliano's theorems for the beam shown below. [8]



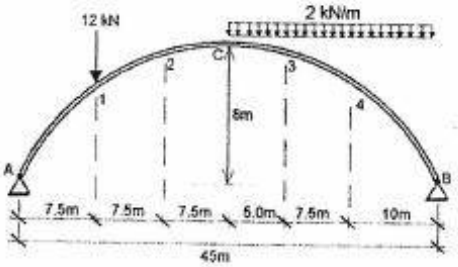
b) Analyze the continuous beam shown in figure and draw BMD by using force method. [8]



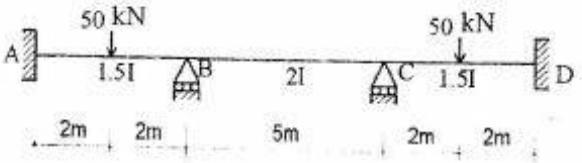
2. a) Determine the member forces of the given truss if temperature on diagonal members rises by 25°C and horizontal members are 5 mm too short. Take E = 2.1 x 10^5 MPa, A = 60 cm^2 for all members and α = 10.6 x 10^{-6}/°C. [10]



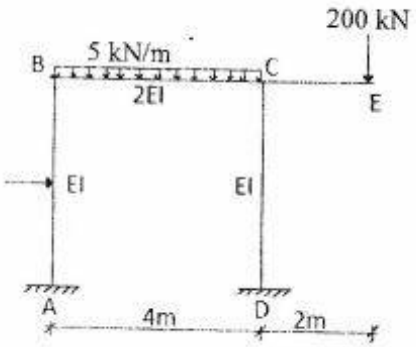
b) Analyze the following loaded parabolic arch. Also find the radial shear, normal thrust and bending at section 2. Support A yields by 50mm and support B yield by 11cm/kN of horizontal thrust. Take EI_C = 4200 kNm^2. [6]



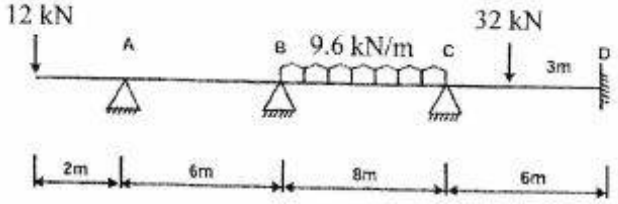
3. a) Analyze the given structure using the slope-deflection method. The structure consists of a reinforced cement concrete (RCC) beam with cross-sectional dimensions of 300 mm X 500 mm and a concrete grade of M25. The modulus of elasticity E = 5000√(fck) N/mm^2. It is observed that support B has lifted up by 5 mm, and support C has settled by 8 mm. Determine the end moments and draw the bending moment diagram. [8]



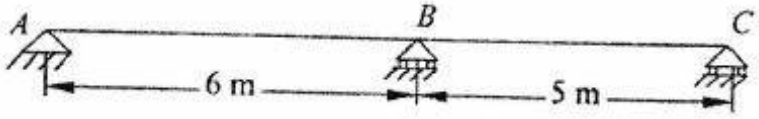
b) Analyze the frame using moment distribution method. [12]



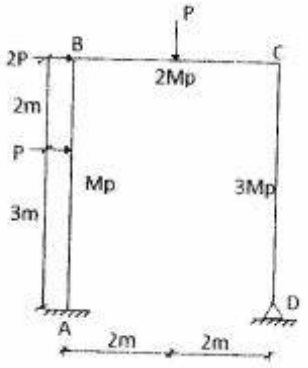
4. Describe stiffness matrix method. Use stiffness matrix method to draw BMD for the beam shown below. [4+8]



5. a) Draw ILD for support reaction at B of the following continuous beam by computing ordinates at 1m interval using Muller Breslau principle. [6]



b) Find the collapse load required for the frame below if factor of safety is maintained 1.5. [10]



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2082 Baishakh

Exam.	Back		
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Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure –II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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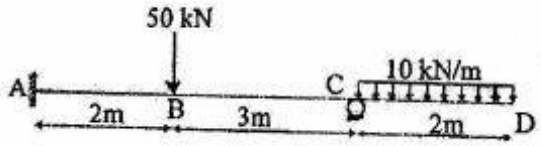
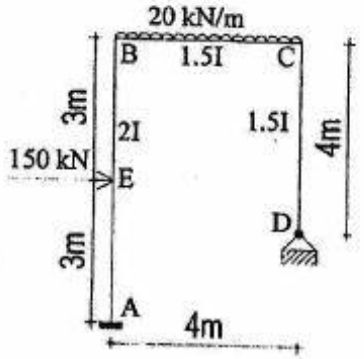
- ✓ *Assume suitable data if necessary.*

1. a) Write the statement of Maxwell's theorem of reciprocal deflection and theoretically prove it. [6]

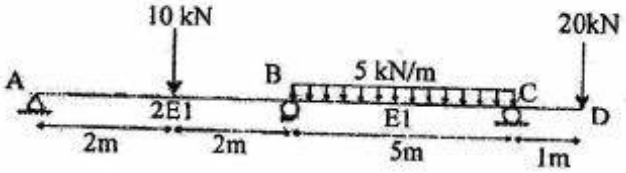
   b) Use Castigliano's method to determine the reactions at supports of the given beam. Take EI to be constant. [6]



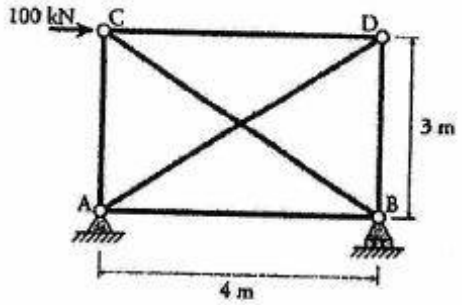
2. Analyze the following structure using flexibility matrix/force method. [10]



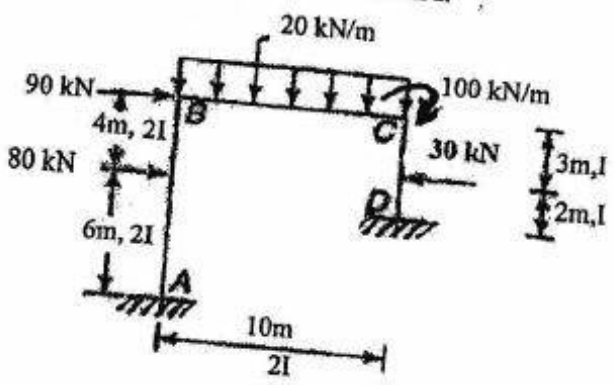
3. Analyze the given continuous beam using three moment equation if support B settles down by 5 cm. Take $E = 2 \times 10^5$ N/mm^2 and $I = 4 \times 10^7$ mm^4. [8]



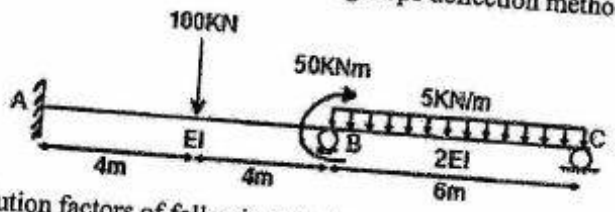
4. Using force method, determine the member forces in the given truss. Take AE = constant. [8]



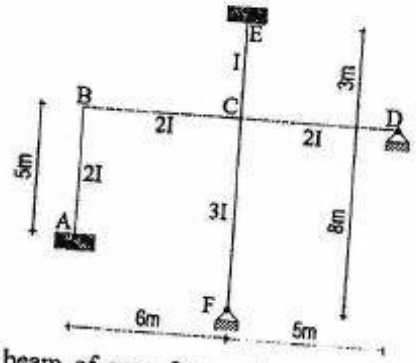
5. Analyze the following frame by stiffness matrix method. [10]



6. Draw BMD for the given continuous beam using slope deflection method. [10]

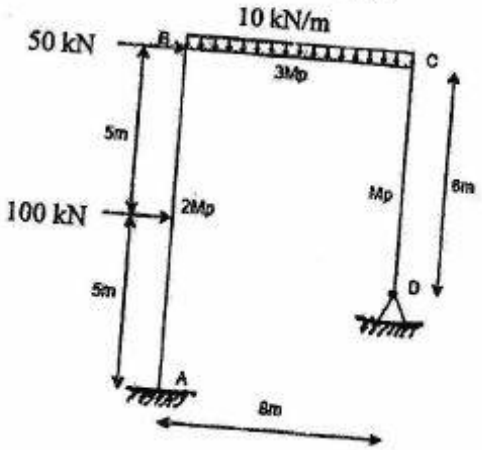


7. Calculate distribution factors of following structure. [6]



8. For a propped cantilever beam of span 8 m, using Muller-Breslau principle, draw the influence lines for support reactions. [6]

9. Calculate the plastic moment capacity of the given frame. [10]



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2081 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
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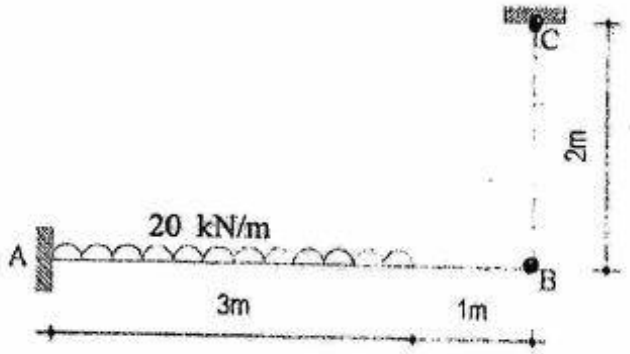
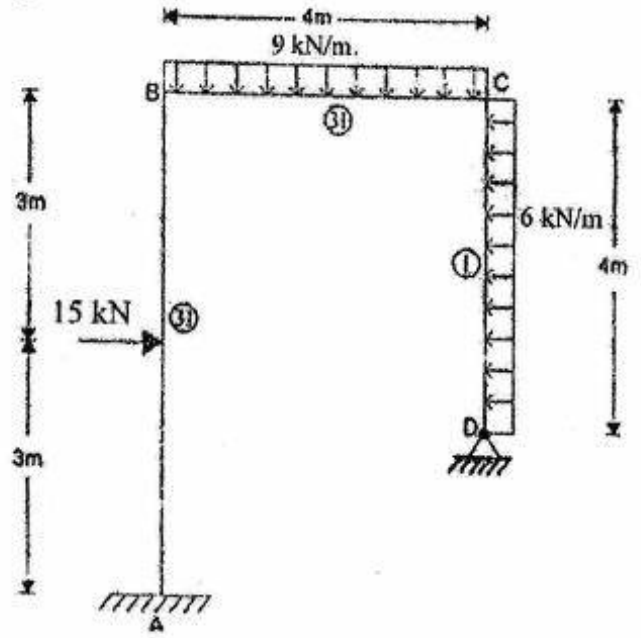
- ✓ *Assume suitable data if necessary.*

1. a) State Betti's law. [2]

   b) The Cantilever beam AB, shown in the figure below, of span 4 m is supported by a 2m long, 3 mm diameter wire CB. Using Castigliano's second theorem, determine the force developed in the wire due to loading shown in the figure. Tak flexural rigidity of the beam EI = 5000 kN-m^2 and the Young's modulus of elasticity of the wire = 200 kN/mm^2. [8]

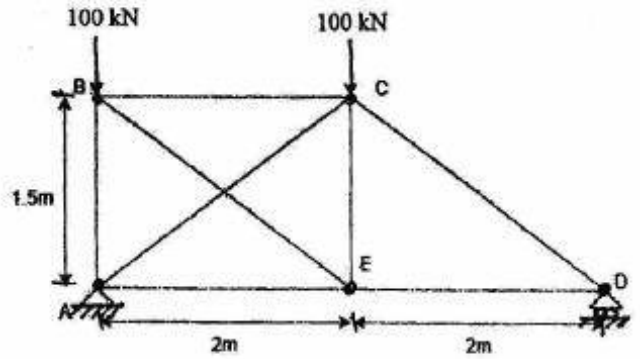


2. Analyze the following structure using flexibility matrix/force method. [10]

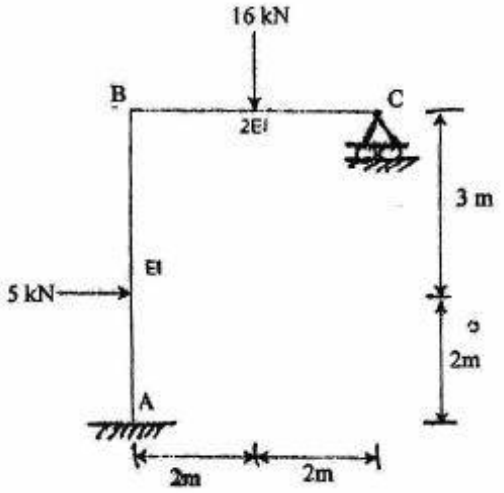


3. A two-hinged parabolic arch of span 60 m and rise of 6 m carries an udl of 30 kN/m over its left half span and point load of 100 kN acting at 10 m from the right support. The moment of inertia varies as the secant of slope $I_x = I_0 \sec\Theta$. Take $I_0 = 6 \times 10^5$ cm^4, A = 1000 cm^2, E = 10 kN/mm^2. If the right support yielded outwards by 5mm, determine: (i) Horizontal thrust (ii) Maximum positive and negative moments. [10]

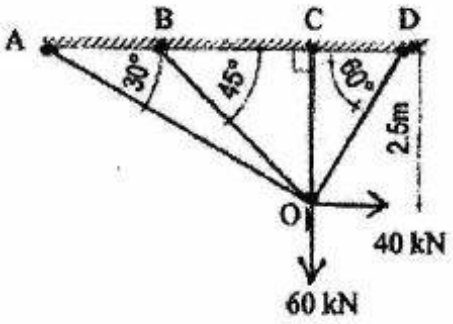
4. Find the member forces of the given truss using consistent deformation method. Take AE to be constant for all members. Support A is hinged and B is roller. [8]



5. Analyze given frame using stiffness matrix method. [10]



6. Determine the member forces in the pin-jointed truss shown in the figure by stiffness matrix method. Take area of cross-section for all members = 800mm^2 and modulus of elasticity E = 200 kN/mm^2. [6]



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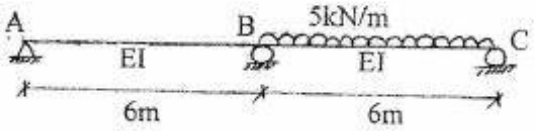
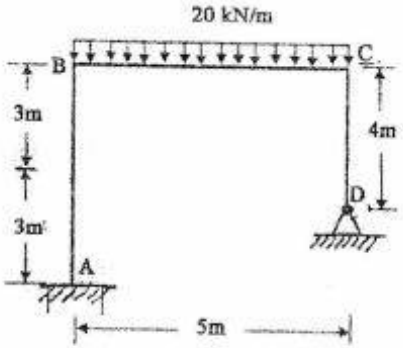
1. a) Discuss how static and kinematic indeterminacies are determined for pin jointed plane frames using suitable example. [4]

   b) Determine the reaction at support B of the given continuous beam using Castigliano's theorem. [6]

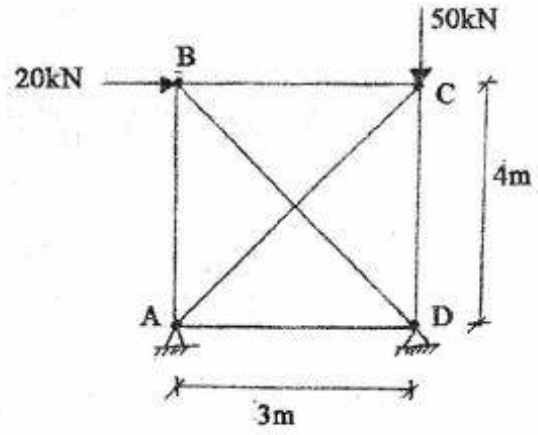


   c) Derive an expression for three moment equation for continuous beam and explain how it can be used for fixed support. [6]

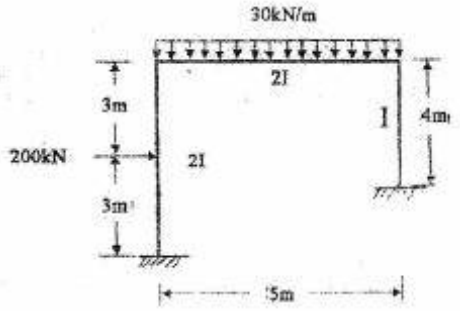
2. a) Analyze the following structure by flexibility matrix method. Also draw bending moment diagram. EI is constant for all span. [10]



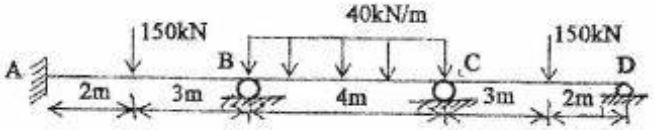
   b) Find the member forces of the given truss using force method if temperature on diagonal members rises by 20°C and vertical members are 5mm too short. Take $E = 2x10^5$ MPa, $A = 50cm^2$ for all members and $\alpha = 10.6\times10^{-6}$/°C. [10]



3. Draw BMD for the given frame using stiffness matrix method. [12]

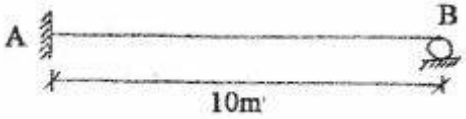


4. a) Analyze the following structure by slope deflection equation method and draw SFD and BMD. EI is constant for all members. [12]

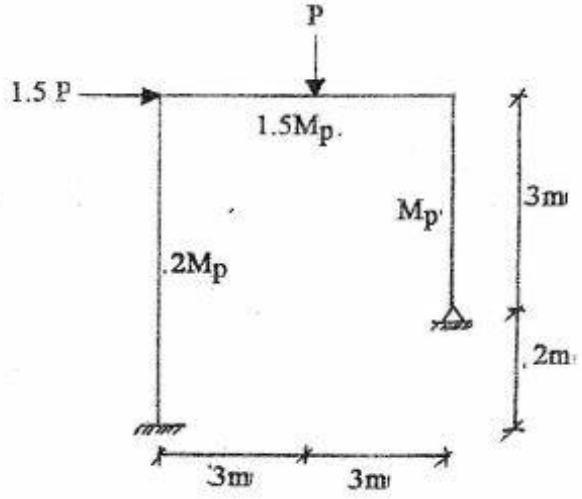


b) Differentiate between flexibility and stiffness matrices with suitable examples in relation to DSI and DKI. [4]

5. a) Draw ILD for vertical reaction at roller support of the given propped cantilever beam. Take the ordinates at an interval of 2 m. [6]



b) Determine the collapse load for the portal frame as shown in the figure below. [10]



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- ✓ *Attempt **All** questions.*
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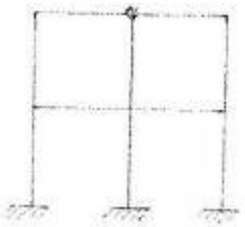
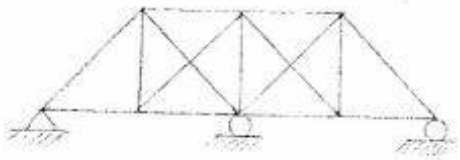
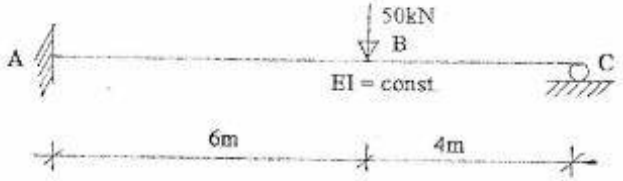
1. a) Determine external and internal degrees of static indeterminacies and degree of kinematic indeterminacies of the frame and truss shown in figure below. [3+3]

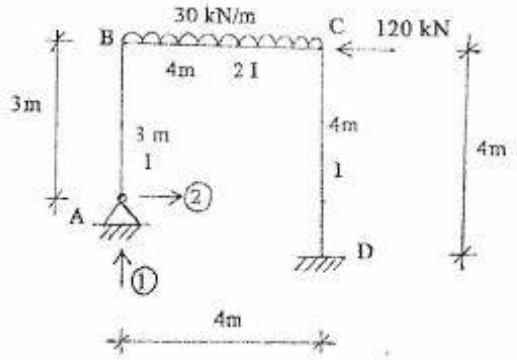




b) Determine the deflection at point B of given beam by using Castigliano's theorem. Take EI constant. [10]

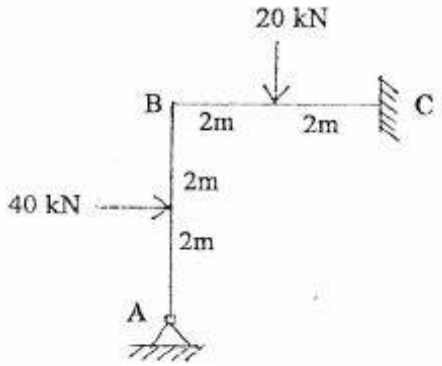


2. a) Determine reactions at hinged support A of the frame shown in figure below using force method. [12]

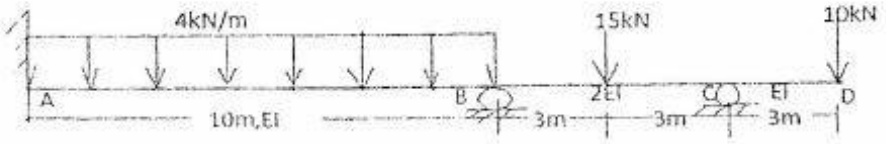


b) Determine reaction and end moment at supports in a fixed beam of span L when right support sinks down by Δ unit. [4]

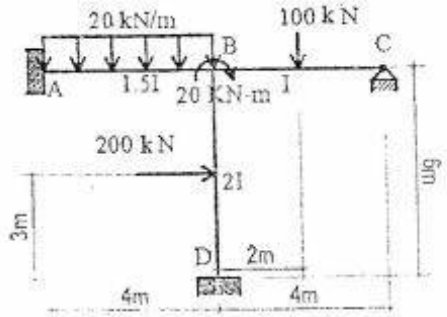
3. a) Analyze the right angled bend shown in figure below using moment distribution method and draw bending moment diagram. [8]



b) Analyze the beam loaded as shown in figure below by slope deflection method. Also draw bending moment diagram. [8]

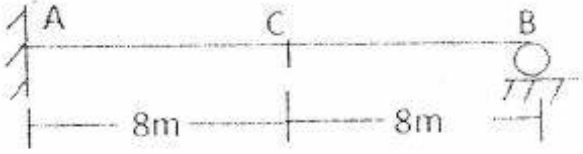


4. a) Analyze the following structure by stiffness matrix method. [10]

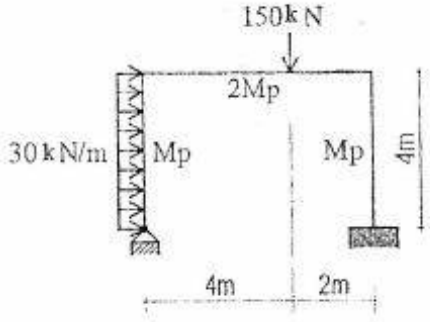


b) Derive member stiffness matrix for truss element. [6]

5. a) Use Muller's theory to draw ILD for bending moment at c for given beam. Calculate ordinates at 2m interval. [8]



b) Calculate the maximum plastic moment capacity of the following structure. [8]



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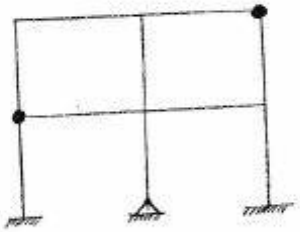
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2080 Baishakh

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

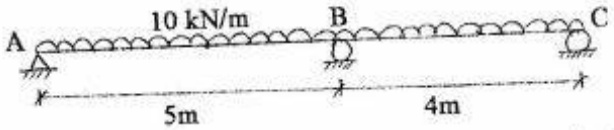
Subject: - Theory of Structures II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks***
- ✓ *Assume suitable data if necessary.*

1. a) Determine the degree of static and kinematic indeterminacy of the given structures. [6]

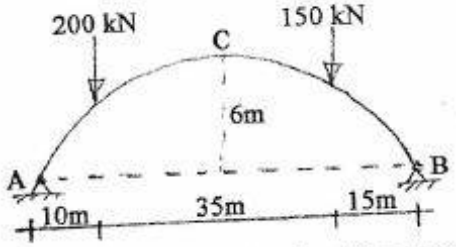


b) Determine the vertical reaction at support B of the given continuous beam using Castigliano's method. Take EI to be constant. [8]

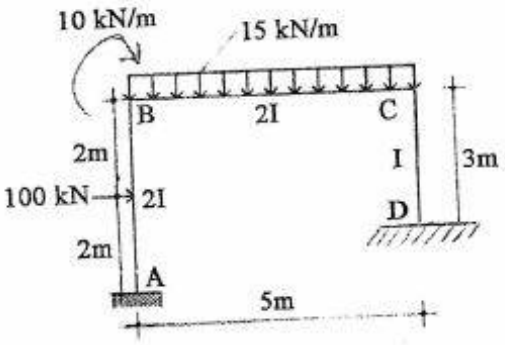


2. a) Using force method, derive expression for support moments of a single span (span = L) fixed beam when right end of the beam rotates clockwise by an angle θ. Also determine the expression for support moments of the same beam when left end of the beam settles down by Δ. Assume constant EI. [10]

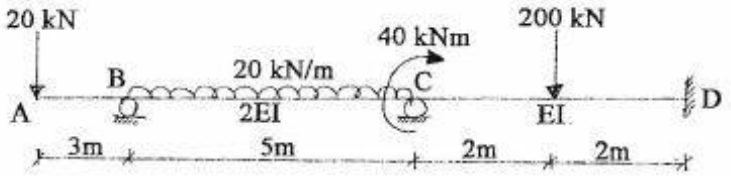
b) Determine horizontal reaction and bending moment at C in the two hinged parabolic arch shown in figure below. [8]



3. a) Analysis of the following given frame structure by stiffness matrix. [12]

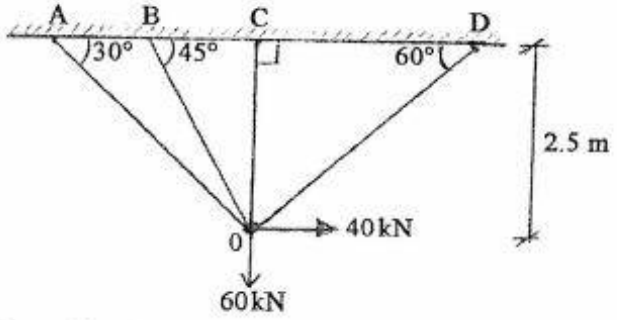


b) Draw BMD of the given continuous beam using slope deflection method if support C settles down by 200/EI. [8]

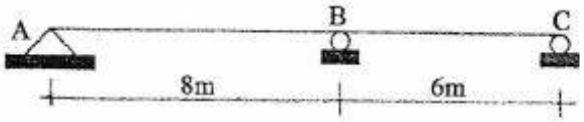


4. a) Differentiate between the force method and displacement method. [4]

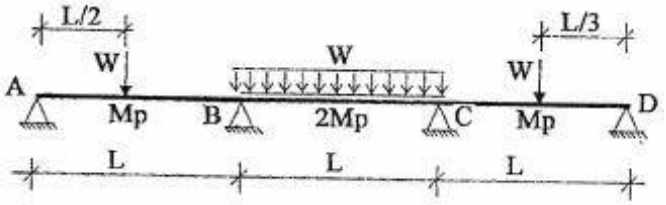
b) Analyse the given pin-jointed truss by the stiffness matrix method. Take area of cross-section for all members = 1000 mm^2 and modulus of elasticity E = 200 kN/mm^2. [8]



5. a) Draw the influence line diagram for moment at B in the continuous beam shown in figure after calculating ordinates at 2m intervals. Assume flexural rigidity is constant thought. [8]



b) Consider the continuous beam as shown in figure. Determine the collapse load W. [8]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2079 Bhadra

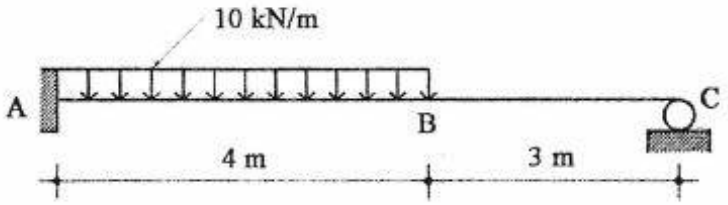
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE 601)*

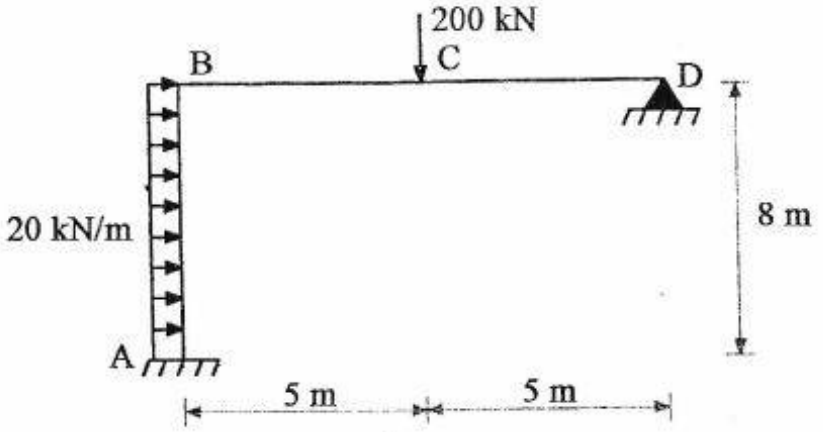
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the degree of static and kinematic indeterminacies with examples. [6]

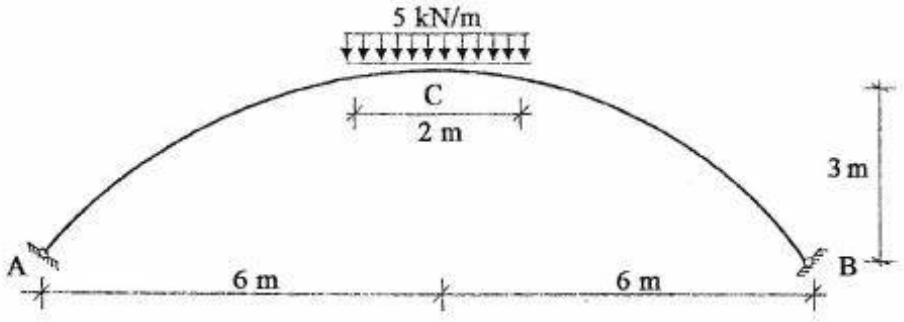
   b) Using Castigliano's theorem determines the deflection at point B for a propped cantilever beam. EI is constant throughout the member. [10]



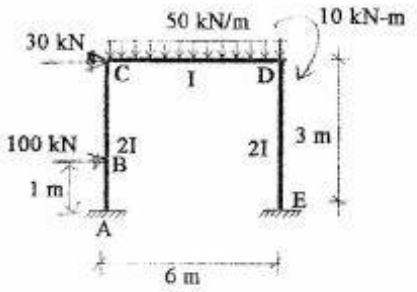
2. a) Determine reactions at hinged support using force method. [10]



   b) Calculate the reactions of the two hinged arch. If there is a temperature rise by 10°C what will be the change in reactions. Assume $I_x = I_o Sec\phi$ and $\alpha = 10^{-5}/°C$. [10]

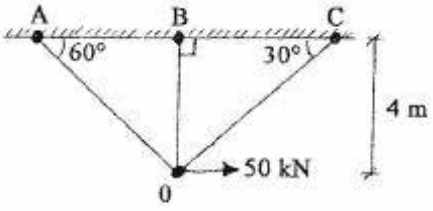


3. a) Analyze the one bay one story frame shown in figure below using either Stiffness Matrix Method. [12]

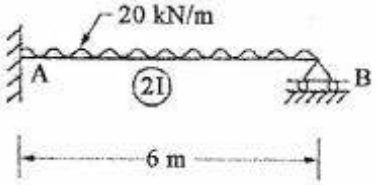


b) What is the moment distribution method? Define carry-over moment and distribution factor. [4]

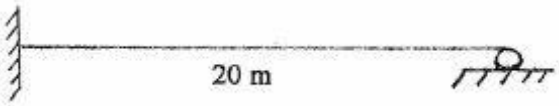
4. a) Generate stiffness matrix of the given truss and use it to find its member forces. [7]



b) Analyse the given propped cantilever bean by using the three-moment equation. [6]

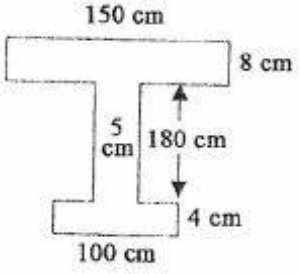


5. a) Draw influence line diagram for moment at fixed support. Find ordinates at 4m interval. [5]



b) Define plastic hinge, plastic moment capacity and shape factor. [4]

c) Determine shape factor for the composite shown in figure below. [6]



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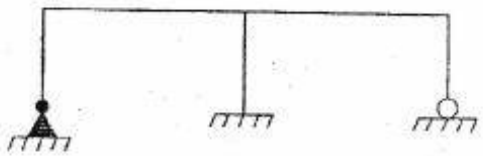
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Bhadra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE 601)*

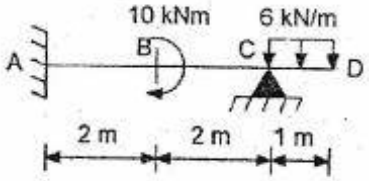
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Determine degrees of static and kinematic indeterminacies of the frame shown in figure below. [4]

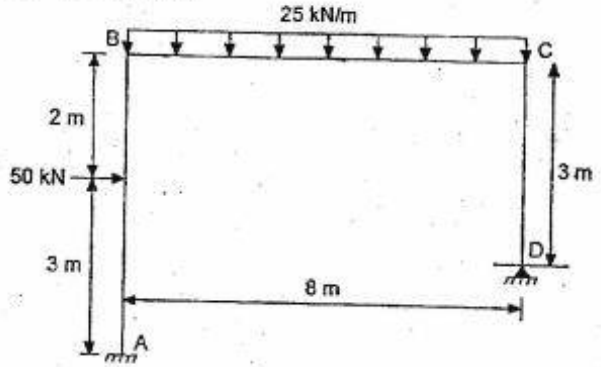


b) State and prove castigliano's second theorem. [6]

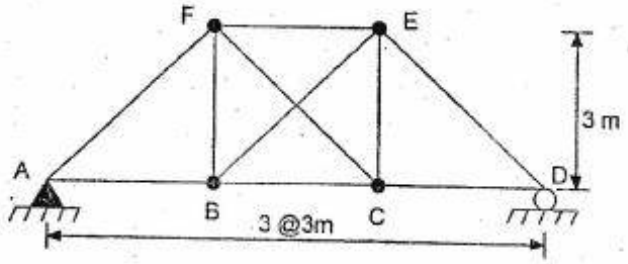
c) Analyze the given loaded beam using castigliano's theorem. The redundant should be considered as support moment at A. EI constant. [6]



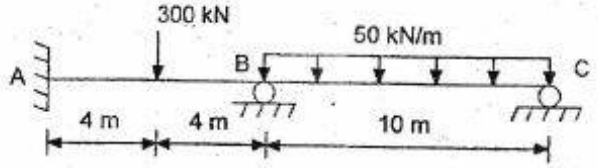
2. a) Analyse the portal frame ABCD shown in figure below using flexibility matrix method. Take EI = 12000 kN/m^2 [10]



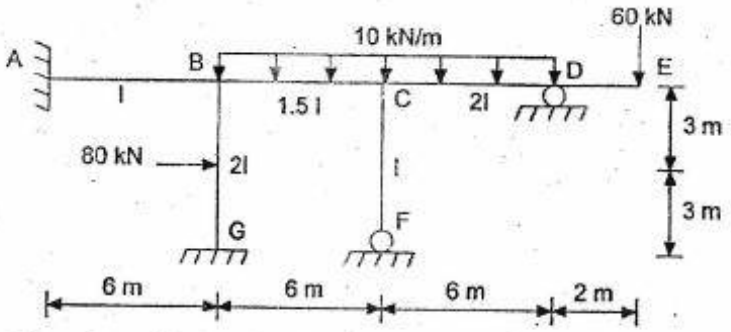
b) Compute the bar force in the member AB, and EF due to the decrease in temperature of 20°C in all vertical members only. Take $\alpha = 12\times10^{-6}$/°C and E = 2×10^5N/mm^2 cross-sectional area of all members are 35 cm^2. [6]



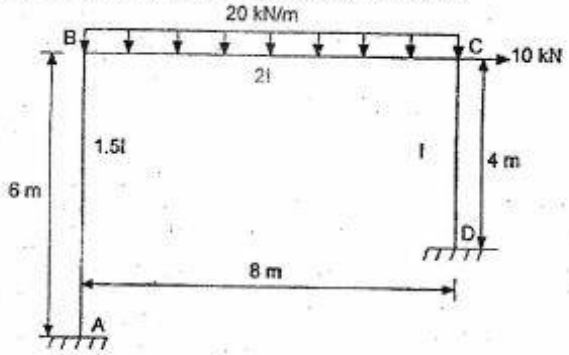
3. a) Draw shear force and bending moment diagram of the continuous beam using three moment equation method. [10]



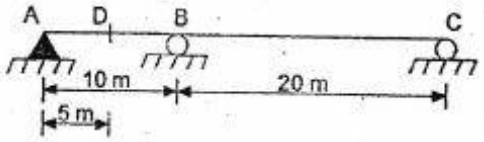
b) Use Moment distribution method to analyze the frame loaded as shown below. Also draw BMD. [10]



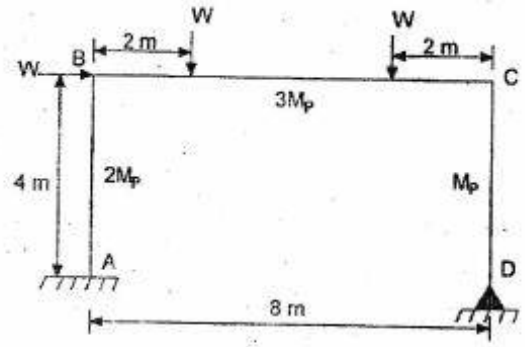
4. Analyse the frame given below using stiffness matrix method. [12]



5. a) Draw influence line diagram for bending moment at point D. find values at interval 2.5 m in span AB and at 5 m interval on span BC. [6]



b) Find the collapse load of the following frame. [10]



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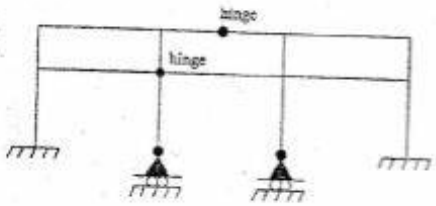
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2078 Kartik

Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

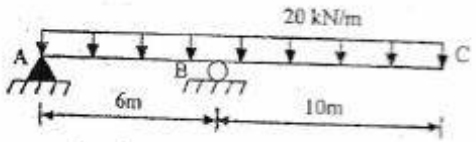
Subject: - Theory of Structures II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

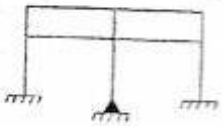
1. a) Determine the external and internal degree of static indeterminacy and also the kinematic indeterminacy of the structure as given below. [3+2]



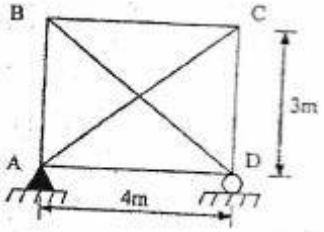
b) Find the reaction at support B using castigliano's method. [6]



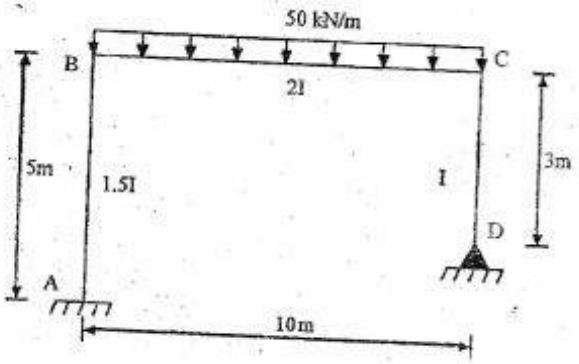
c) Define flexibility and stiffness coefficient. For the given frame which of the method either force or displacement method is suitable. Given your reasons. [2+3]



2. a) Determine forces in all members of the truss shown in figure below if the member AC is too long by 10 mm. Take AE is constant for all members. [6]

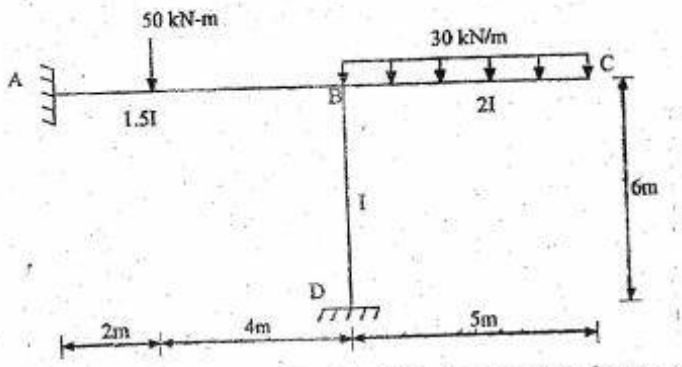


b) Determine reactions at hinged support of the frame loaded as shown in figure below using force method. [10]

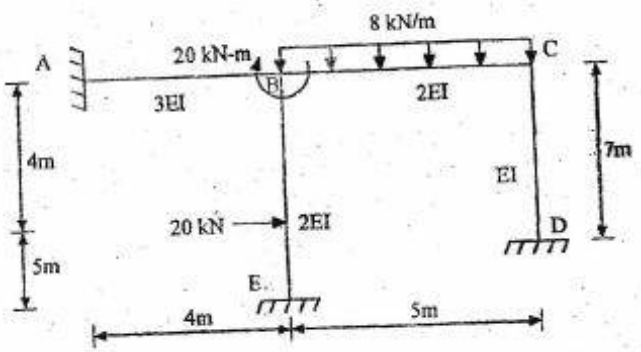


3. a) A two hinge parabolic arch of span 60 m and central rise of 6 m is subjected to a concentrated load of 40 kN at the crown. Allowing for rib shortening and yielding of support B by 6 mm outwards horizontally, determine the horizontal thrust. Also draw BMD. Take $I_0 = 6\times10^5 cm^4$, $A_C = 1000\ cm^2$, $E = 10\ kN/mm^2$ and consider $I_x = I_0 \sec \alpha$. [8]

b) Draw bending moment diagram of the frame given below using moment distribution method. [10]

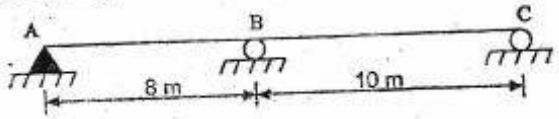


4. a) Compute the final end moments for the following loaded frame using stiffness method. [12]

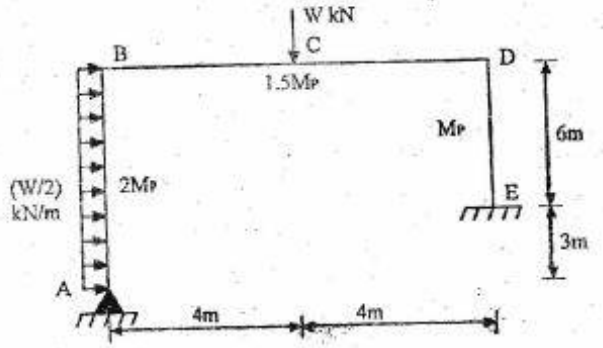


b) Write slope-deflection equation and mention all the symbols used. [2]

5. a) Draw the ILD for bonding moment at B. [6]



b) Determine collapse load in the frame shown in figure below. [10]



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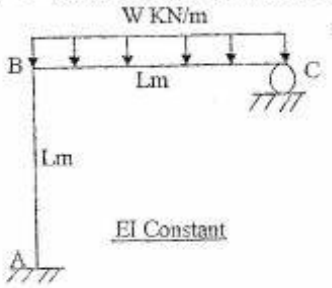
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

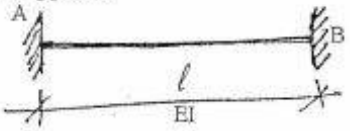
Subject: - Theory of Structures II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

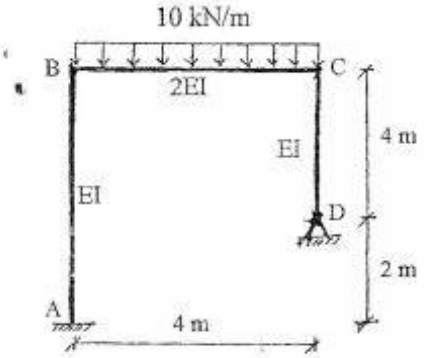
1. a) Explain theorems on displacement with suitable illustration. [4]
   b) Find the reaction at support 'C' using Castigliano's theorem. [6]



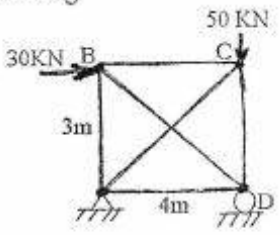
   c) In the given beam support 'B' is settled down by 'Δ' units without rotation. Determine reactions at the supports. [6]



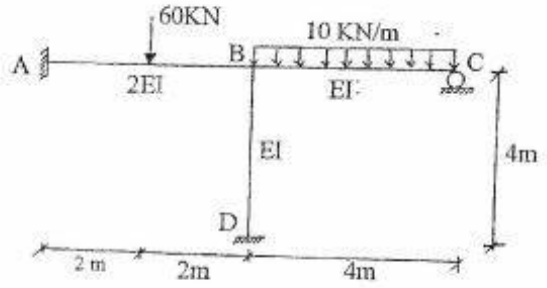
2. a) Determine reactions at hinged support using Force method when support D settles vertically downward by 200/EI. Take EI to be constant. [10]



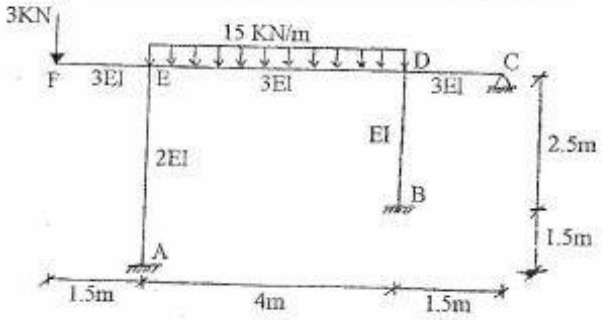
   b) Find the member forces of given loaded truss for given external loadings and due to rise in temperature of all diagonal members by 20°C. Take AE = 5000KN for all members and coefficient of thermal expansion as 2.06×10^{-6}/°C. Additionally, vertical members are 5mm too long. [10]



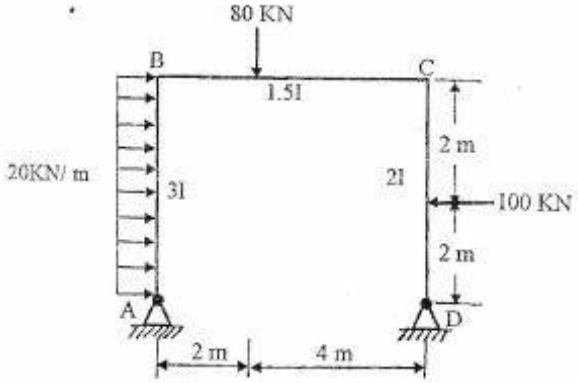
3. Draw BMD of the given frame using Stiffness matrix method. [12]



4. a) Derive expressions for Slope deflection equations for continuous beams. [4]
   b) Draw BMD of the given frame using moment distribution method. [12]



5. a) Draw ILD for reaction moment at fixed support of the propped cantilever beam of span 10m. Take ordinate interval as 2m. [6]
   b) Find the plastic moment capacity of the frame shown in figure below. [10]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Ashwin

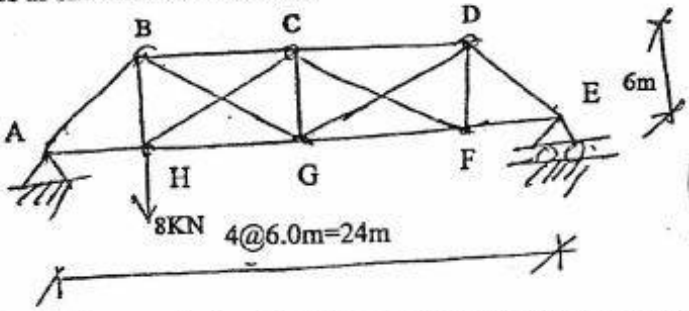
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

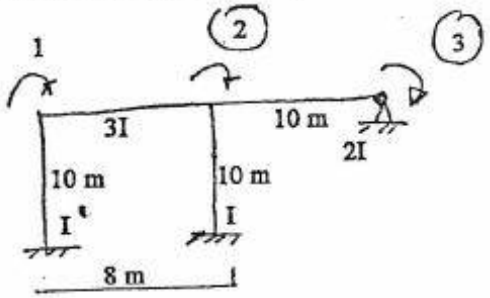
1. a) Enunciate Betti's law and Maxwell's Reciprocal theorem and explain their uses. [6]

   b) Compute the bar forces in the members BG, HC, and CF of the following loaded truss structures as shown. AE = constant. [10]



2. a) Determine end moments in a fixed beam of span L when one of the supports settles down by Δ units. Take EI as the cross sectional stiffness of the beam. [6]

   b) Generate stiffness matrix of the structural system. [10]

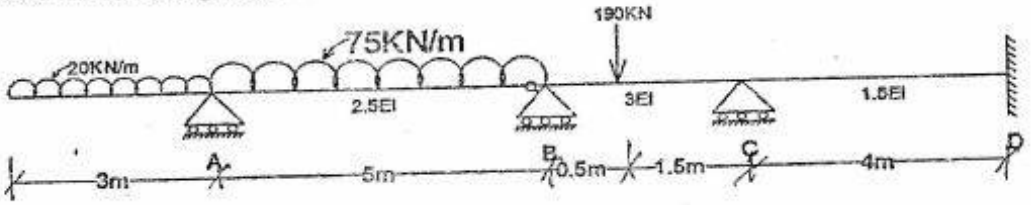


3. a) Derive slope deflection equations for a beam of span L and cross sectional stiffness EI. Assume other data, if required. [6]

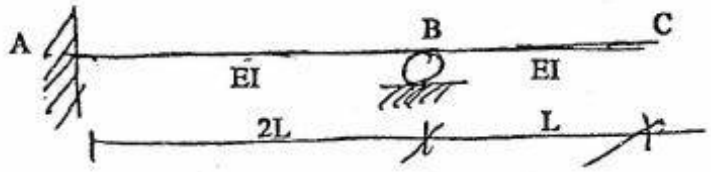
   b) Determine moment at fixed support and rotation at roller support of a propped cantilever beam of span 10m and loaded with uniformly distributed load 30kN/m on its whole span and a point load of 50 KN at the centre using castigliano's theorem. [10]

4. a) Write down the compatibility equation for two hinged parabolic arch due to external loads, variation in temperature, Rib shortening and yielding of supports. [6]

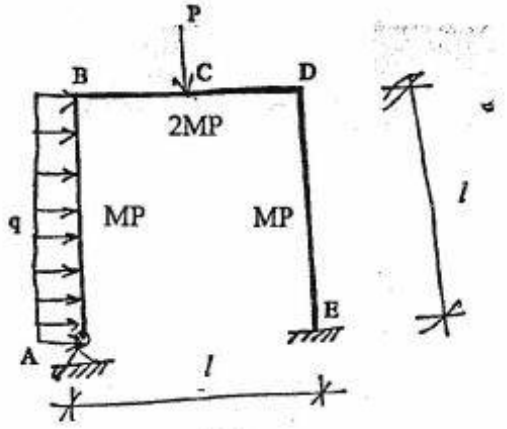
   b) Draw BMD using slope deflection method. [10]



5. a) Draw Influence Line diagram for moment at support B of a propped cantilever beam as shown. Plot ordinates at 0.50 times span length. [6]



b) Evaluate the collapse load for the given portal frame. Assume P=2ql. [10]



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TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

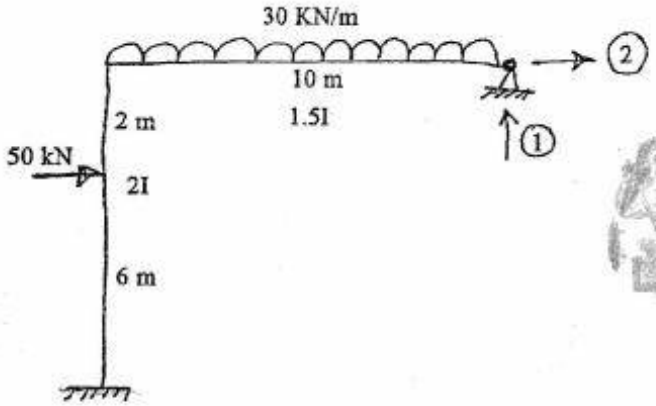
Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE 601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

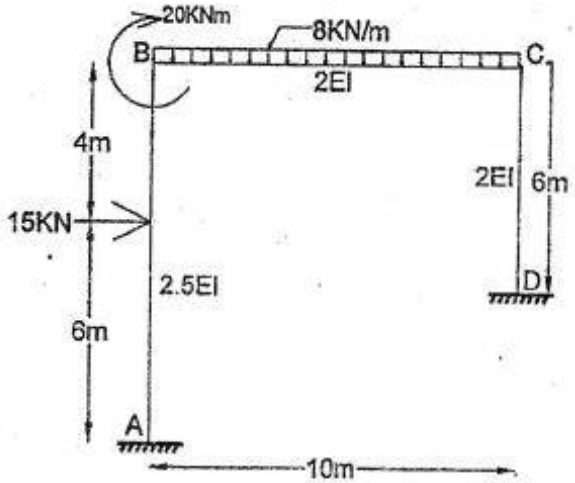
1. a) Define degree of static and kinematic indeterminacies and give suitable examples related to pin jointed, rigid jointed and hybrid structures to explain the concept. [6]

   b) Determine reactions at hinged support in the frame shown in figure below using force method. [10]



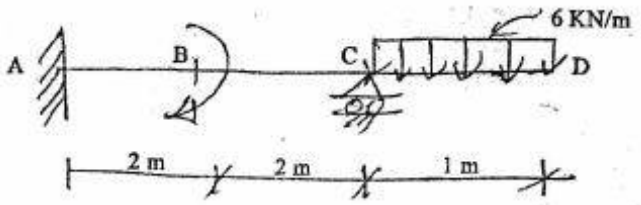
2. a) Determine end moments in a fixed beam of span L when left fixed support rotates clockwise by θ_A radian. Take EI as constant. [6]

   b) Compute the final end moments for the following loaded frame using stiffness matrix method. [10]

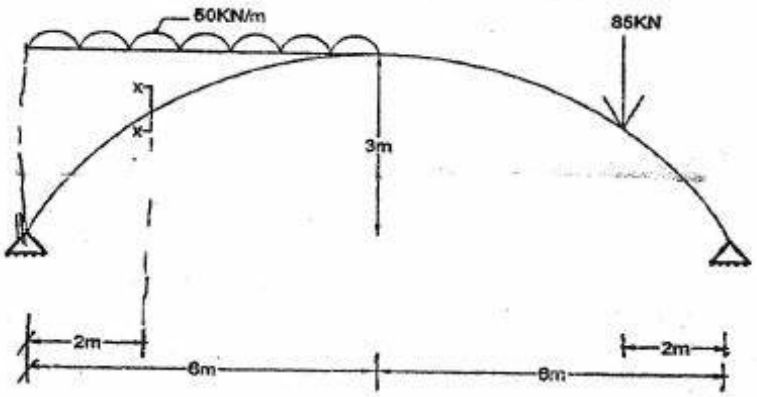


3. a) Explain with a neat sketch the concept of distribution and carry over factors in moment distribution method and give example. [6]

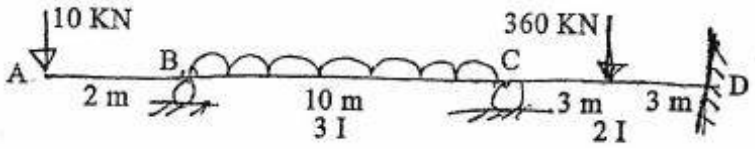
b) Determine the support reaction at support 'C' using Castigliano's theorem. EI=constant throughout. [10]



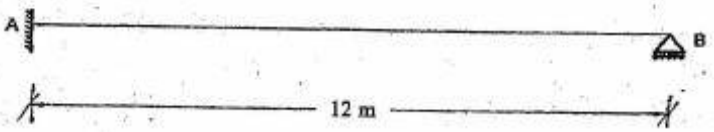
4. a) Find the bending moment at a given section x-x of the following loaded two hinged parabolic arch due to given loading. Take $EI_C=10000KNm^2$. [6]



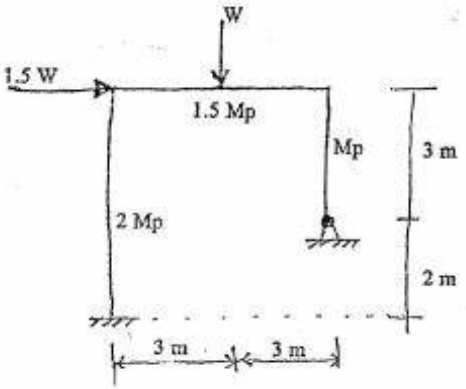
b) Determine end moments and draw bending moment diagram by using slope deflection method. [10]



5. a) Draw ILD for the support moment at A by computing the ordinates at 3 meter intervals. [6]



b) Determine collapse load in the portal frame shown in figure below. [10]



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03 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Ashwin

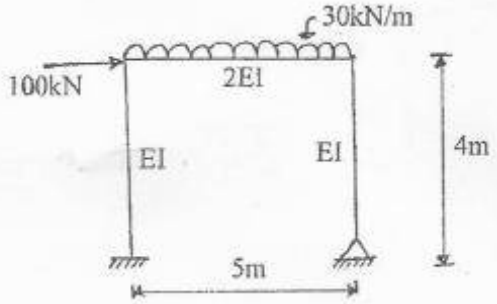
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) What is structural idealization? Explain the steps involve during identification and formulation of problems in theory of structure. [3+3]

   b) Determine the horizontal and vertical reaction at hinged support and also draw BMD using Force method. [10]

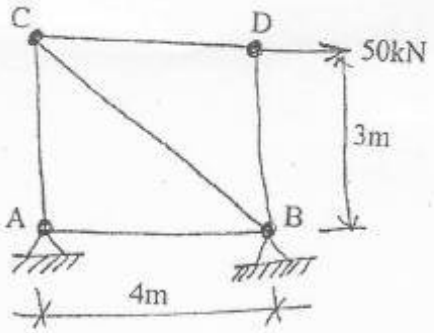


2. a) "Displacement method is unique in comparison to force method". Justify the statement giving suitable example. [4]

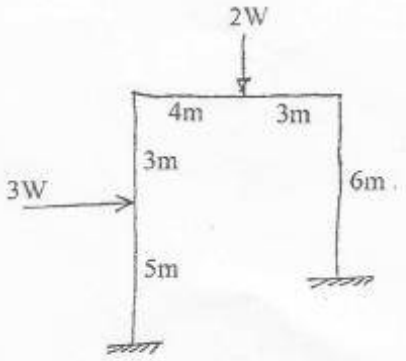
   b) Determine reaction at support B of the beam shown in figure below by castigliano's method. [6]

   c) A portal frame of span 6m and height 5m is hinged supported at both ends. The beam of the frame carries a uniformly distributed gravity load of intensity 50 kN/m. Use force method to solve the frame considering the flexural stiffness EI to be constant. Determine the reactions at both supports. [6]

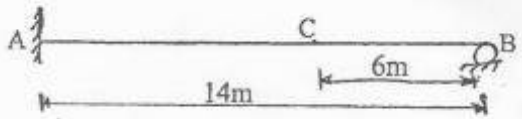
3. a) Determine the forces in all members of the truss shown below, using force method. Take EA = 10^5kN. [8]



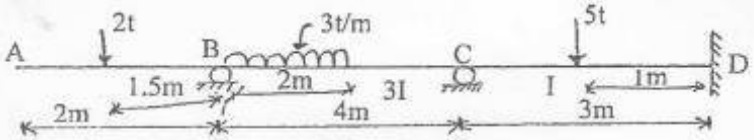
b) Determine the collapse load Wc for the rectangular portal frame shown in figure below. [8]



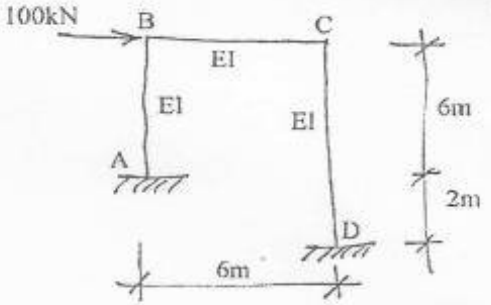
4. a) Draw ILD for S.F. at point C of the propped cantilever beam shown in figure below. [6]



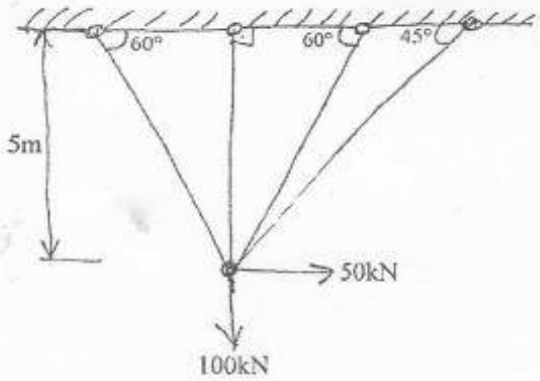
b) Analysis the continuous beam loaded as shown in figure below using slope deflection method considering settlement of support C by 4mm downward. Take $EI = 1\times10^9$ t mm^2. [10]



5. a) Generate stiffness matrix for the frame shown and determine the end reactions at the support. [8]



b) Analyse the truss by displacement method. Take $E = 2\times10^5$ MPa, $A = 8$ cm^2 [8]



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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Chaitra

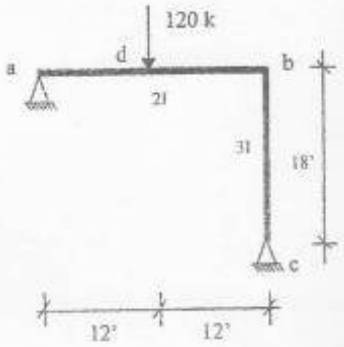
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

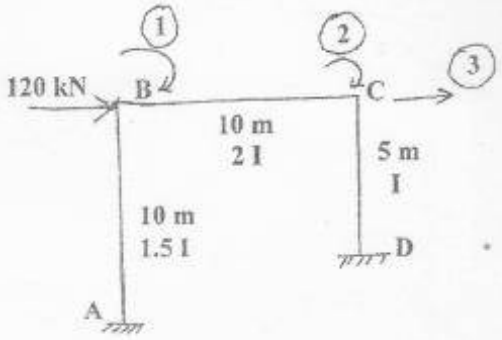
1. a) Define degree of static and kinematic indeterminacies. Give examples for each. [6]

   b) Analyze the structure given below using Force method. Draw Shear force and Bending Moment diagrams. [10]

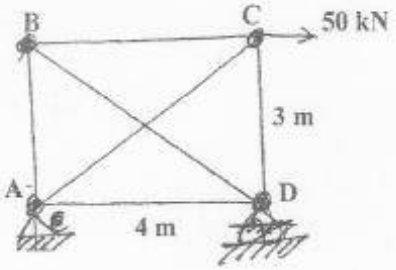


2. a) Derive the three moment equation and use it to solve single span fixed beam with uniform distributed load throughout the span. [6]

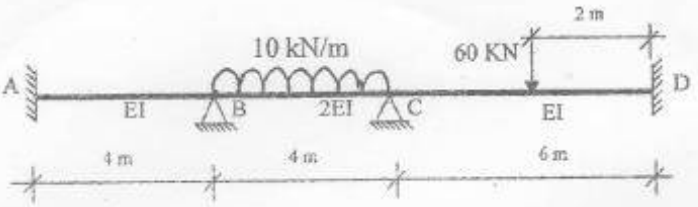
   b) Generate stiffness matrix for the frame shown in below figure and determine the end moments and horizontal reactions at supports due to the load given. [10]



3. a) Determine forces in all members of the truss shown in figure below using force method. AE for all members is constant. [10]

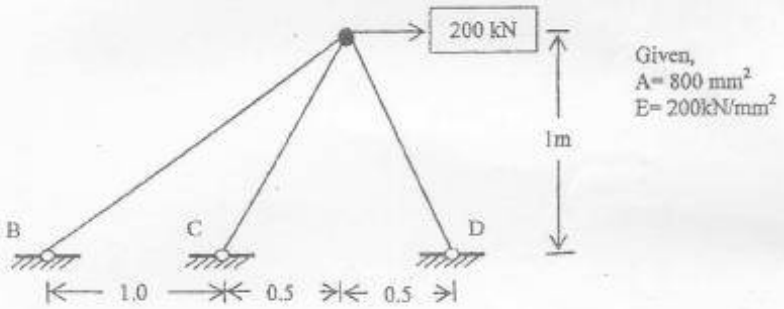


b) Analyze the continuous beam shown in figure below by slope deflection method. Given $I = 4*10^7$ mm^4, and $E = 200$ kN/mm^2 Draw Bending Moment diagram. [8]

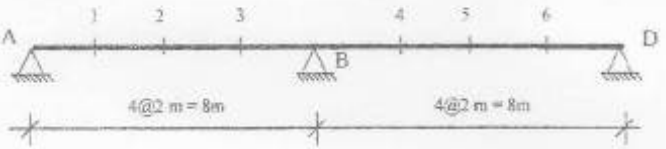


4. a) Explain with example how bending moment diagram is drawn for a statically indeterminate portal frame which undergoes settlement of one support. [4]

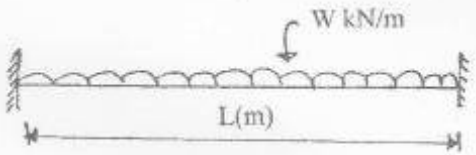
b) Analyze the truss shown in figure below by the stiffness matrix method and find the vertical and horizontal displacement at node A. [8]



5. a) Draw the influence line for bending moment at Section 5 of a two span continuous beam as shown in figure below. Given ordinate at 2m interval. [10]



b) Determine collapse load for the following beam. [4]



c) Calculate the reaction at the prop of a propped cantilever with uniform distributed load throughout the span using Castigliano's theorem. [4]

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01 / TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2074 Ashwin

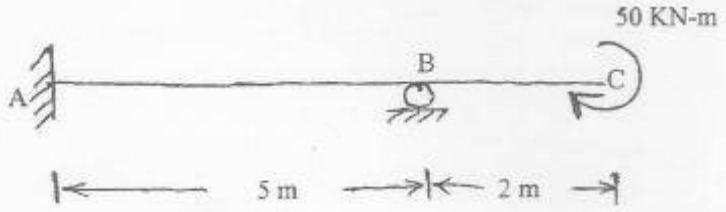
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe the degree of static indeterminacy and the degree of kinematic indeterminacy of a structural system with suitable expressions and examples. [5]

   b) Determine the moment at the fixed support of the following loaded beam using Castigliano's theorem. Take EI constant. [6]

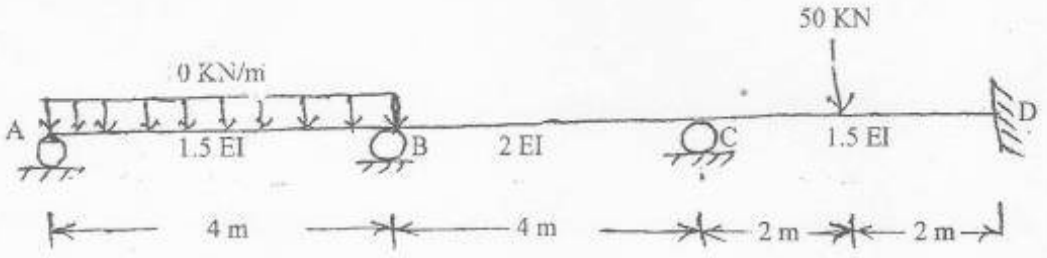


   c) Enuciate Mueller-Breslau principle of influence line and prove it with an example of a continuous beam. [5]

2. a) Explain the principle of moment distribution method with a simple example. [6]

   b) A portal frame of span 4 m and height 4 m is fixed at both supports. The beam of the frame carries a uniform distributed gravity load of intensity 30 KN/m. Use Force method to solve the frame considering the cross-sectional stiffness (EI) to be constant. Draw bending moment, shear force and normal thrust diagrams for the frame. [10]

3. a) Analyse the continuous beam loaded as shown in figure below and draw the bending moment diagrams using slope-deflection method. Support B sinks by 19 mm. [12]

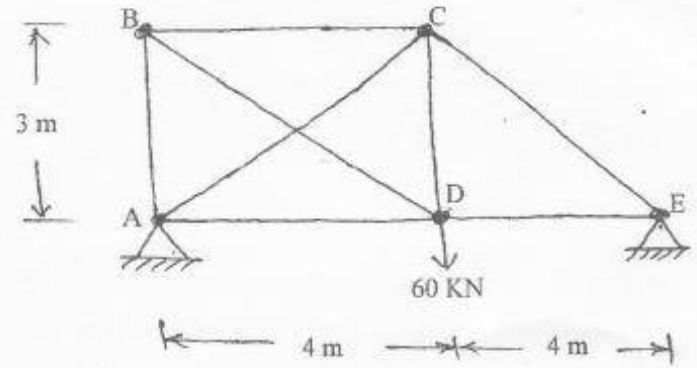


   Take EI = 10,000 KN-m^2

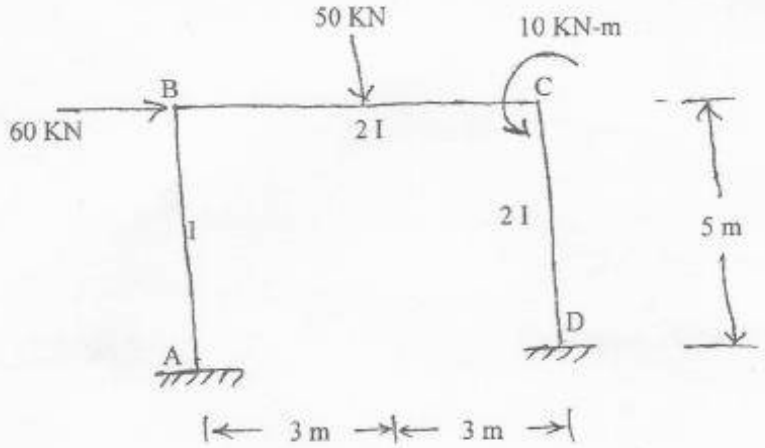
   b) Define plastic hinge. Also compare plastic and elastic hinges of a structural system. [4]

4. a) Define the term left and right focal point ratios. Also write their expressions. [4]

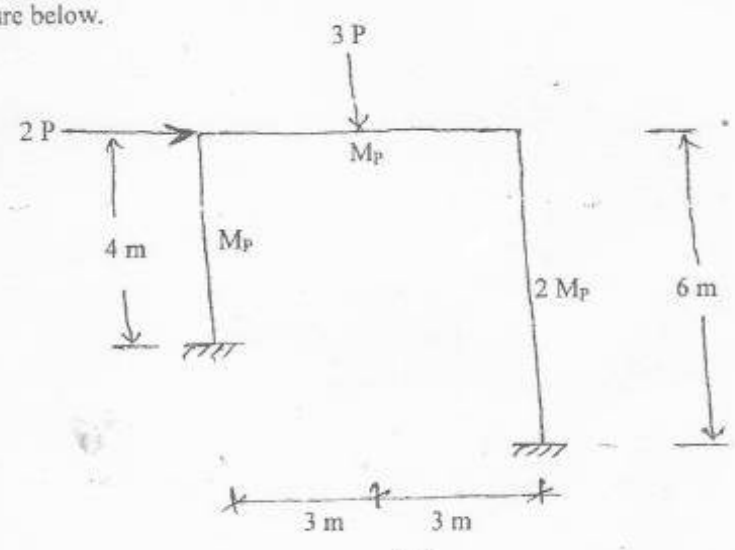
b) Analyse the truss shown in figure below using "Force Method". Take the cross-sectional stiffness EA of the members to be constant. [12]



5. a) Generate stiffness matrix the frame loaded as shown in figure below. Also determine the end moments considering stiffness equations of each member. [10]



b) Determine the collapse load, W_p, for the rectangular portal frame loaded as shown in figure below. [6]



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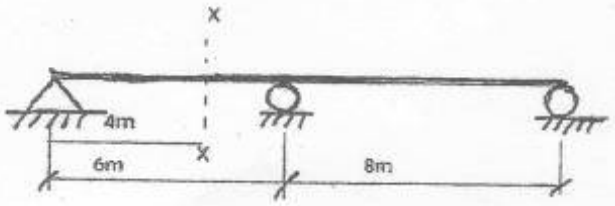
01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 Shrawan

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

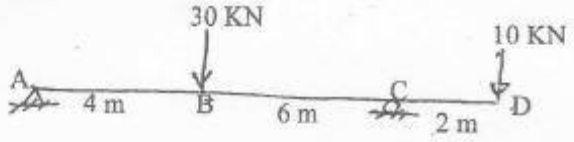
Subject: - Theory of Structure II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Draw influence line diagram for moment at section x-x of the continuous beam shown in figure below. Find the ordinates at 2 m intervals. [5]

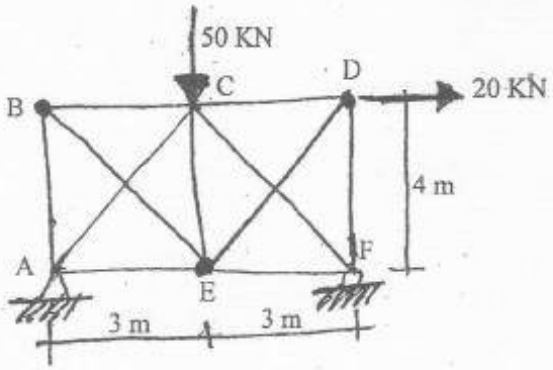


b) Determine slope at A and deflections at D of the beam shown in figure below using castigliano's theorem. [10]



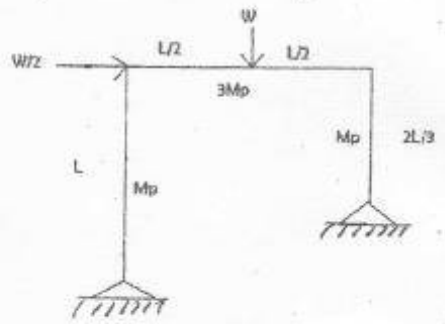
2. a) Define and explain the following terms: [5]
   i) Primary structure
   ii) Redundant force
   iii) Flexibility coefficient
   iv) Stiffness coefficient
   v) Kinematic indeterminacy

b) Determine the forces in all members of the truss shown in figure below using force method. [12]



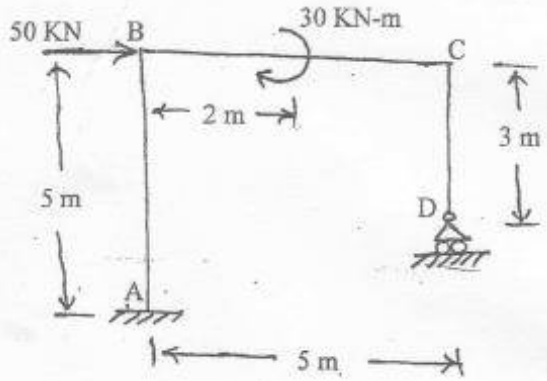
AE is constant for all members

3. a) Find the collapse load for portal frame shown in figure below. [10]

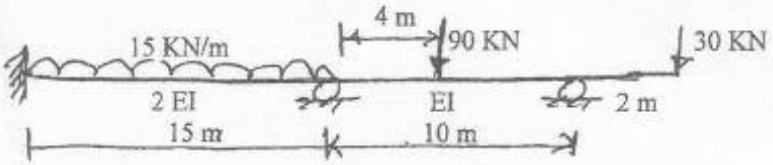


b) Derive the expression of three moment theorem for continuous beam and explain its physical meaning. [6]

4. a) Using flexibility matrix method, determine the reactions at support D of the frame loaded as shown in figure below. Also draw SFD and BMD. Take EI = constant. [7]

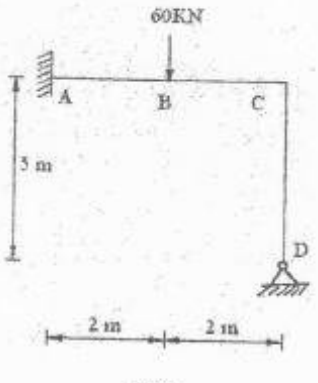


b) Analyse the continuous beam shown in figure below using slope deflection method. [10]



5. a) Derive the slope deflection equations. [5]

b) Using stiffness matrix method, draw bending moment diagram for the frame shown in figure below. Take constant EI. [10]



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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Chaitra

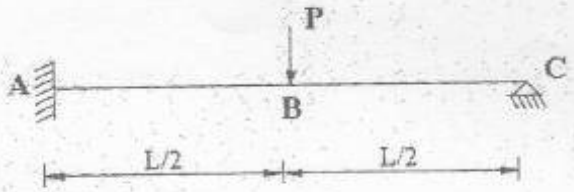
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt All questions.*
- ✓ *The figures in the margin indicate Full Marks.*
- ✓ *Assume suitable data if necessary.*

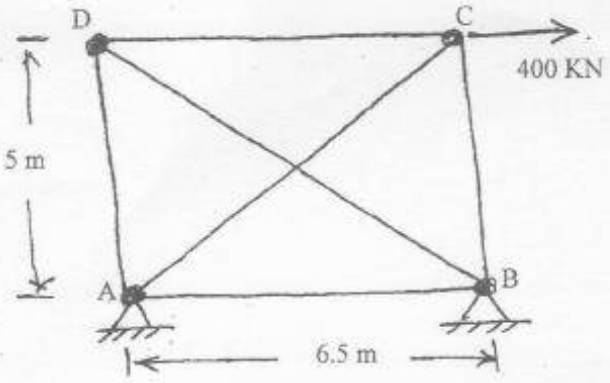
1. a) Draw influence diagram for vertical reaction at fixed support of a propped cantilever beam. Plot ordinates at 0.25 times span length. [4]

   b) Using Castigliano's theorem, find the deflection at point B of the beam shown in figure below. Take constant EI through the length. [12]



2. a) State and proof Maxwell's Reciprocal theorem. [4]

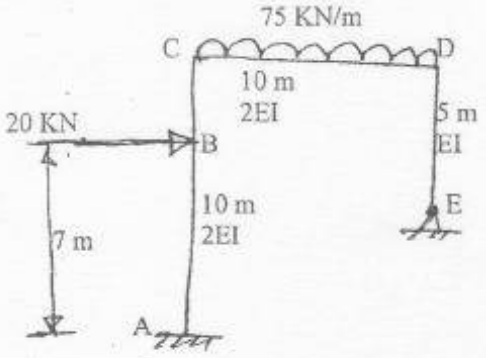
   b) Determine the bar forces and reactions that develop in the statically inderminate truss shown in figure below. [12]



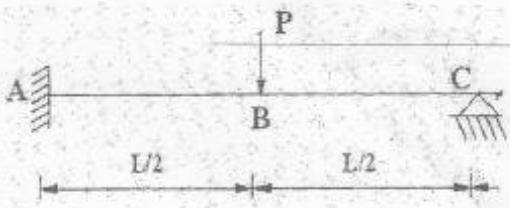
-Cross sectional Area:
Member BD = 20 cm^2
Other members = 15 cm^2
-Young's modulus = 240×10^6 KN/m^2

3. a) Define plastic moment and shape factor. [3]

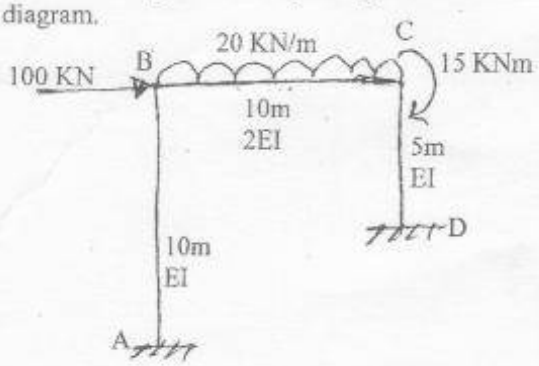
   b) Determine the reactions at support E and A and draw bending moment diagram of the frame shown in figure below by using flexibility matrix method (force method) [13]



4. a) A propped cantilever beam of uniform Mp is loaded as shown in the figure below. Find the collapse load. [4]

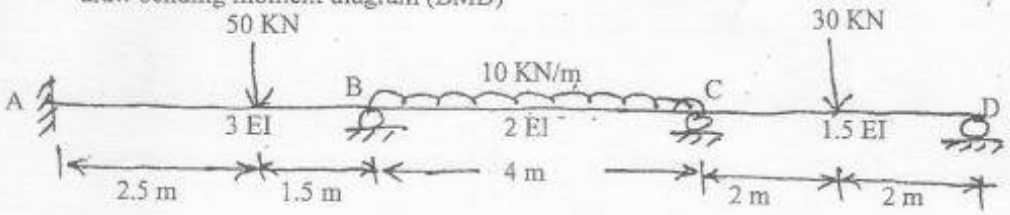


b) Analyse the frame shown in figure below by using stiffness matrix method and draw bending moment diagram. [12]



5. a) Define plastic hinge and explain how its length is determined. [4]

b) Analysis the beam loaded shown in the figure below by slope deflection method. Also draw bending moment diagram (BMD) [12]



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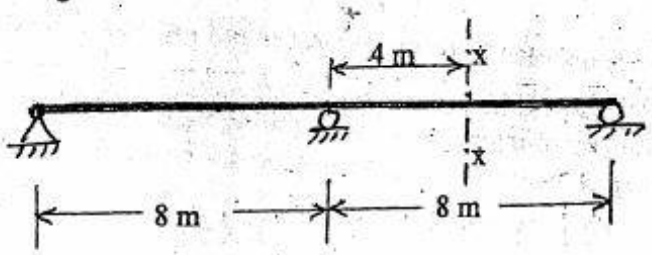
01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Kartik

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

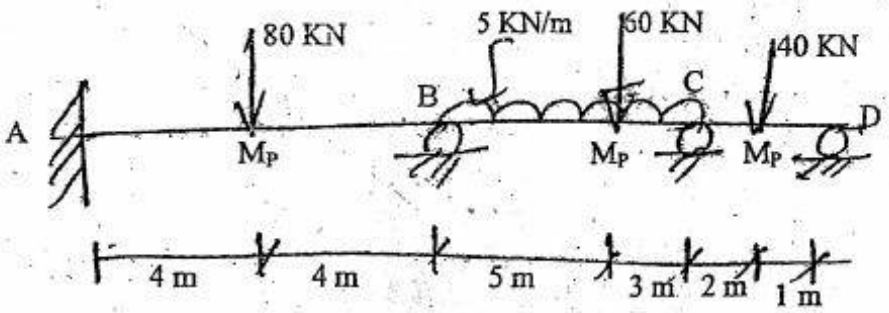
Subject: - Theory of Structure II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

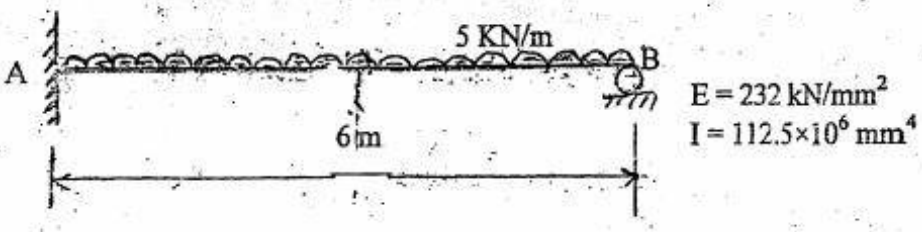
1. a) Draw influence line diagram for shear at the section x-x for the two-span continuous beam shown in the figure below. Draw the ordinate at 2 m interval. [6]



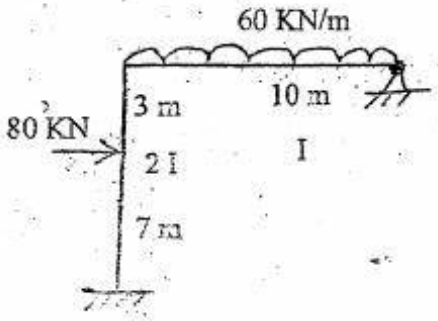
b) A prismatic continuous beam ABCD is fixed at A and simply supported at B, C and D. It is subjected to factored loads as shown. Find the collapse mechanisms and draw BMD. [10]



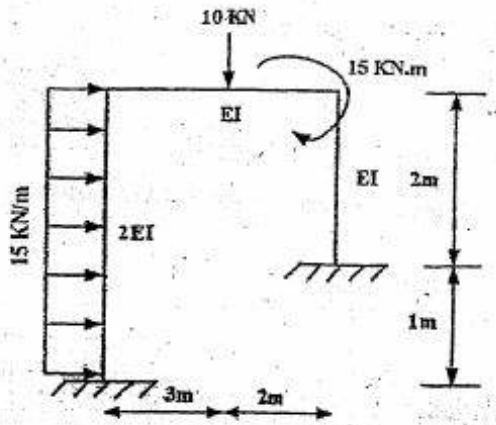
2. a) Using Castigliano's theorem, determine the moment at the fixed support A of the propped cantilever beam loaded as shown in figure below. [6]



b) Analyse the frame shown in figure below by using force method and draw bending moment diagram. [10]

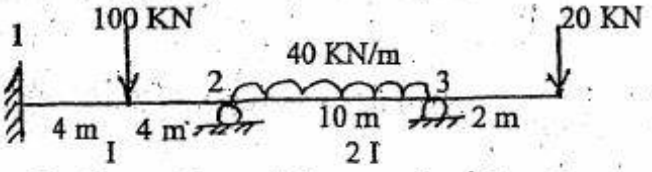


3. a) Analyse the frame shown in figure using stiffness matrix method. Consider only flexural deformations. [10]

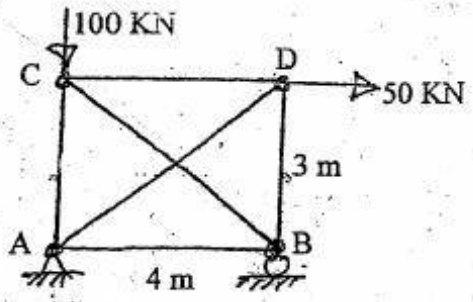


b) List the differences between force and displacement methods. Draw a neat sketch of a system and explain. [6]

4. a) Determine the support moments and draw bending moment diagram of the continuous beam shown in figure below by using three moment equation. [7]

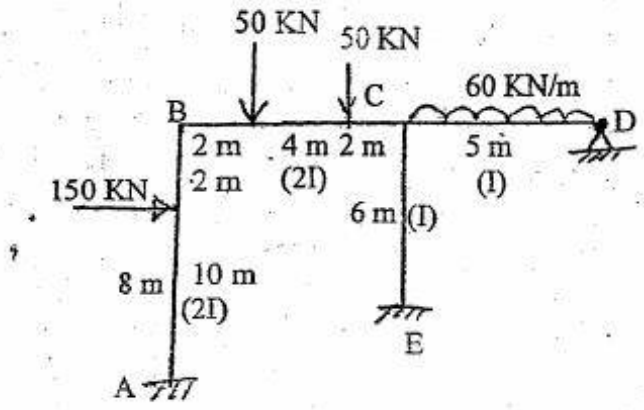


c) Determine the forces in all members of the truss by using force method. AE is constant for all members. [7]



b) Write down the boundary conditions for a single span beam fixed at both ends. [2]

5. Analyse the frame shown in figure below by using moment distribution method. [15]



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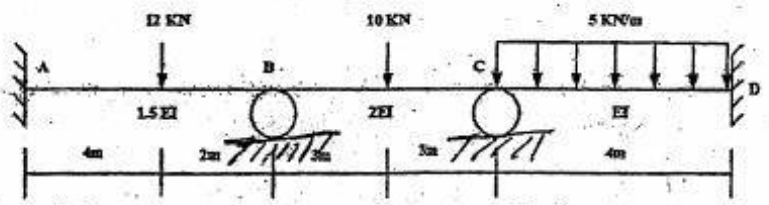
5. A continuous beam is shown in figure support 'B' sinks by 10mm down and 'C' rises by 20 mm up during loads. Analyse the given beam using slope deflection method and also draw bending moment diagram and show deflected shape. [15]

$E = 200*10^6\ KN/m^2$ and $I = 80*10^{-6}\ m^4$



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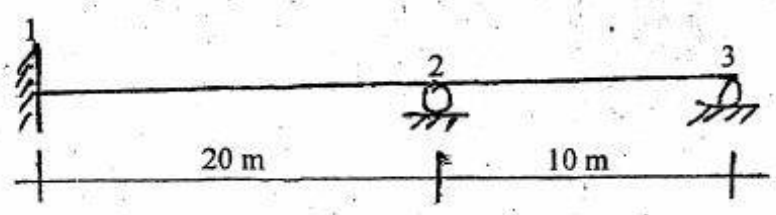
01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 Chaitra

Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / II	Time	3 hrs.

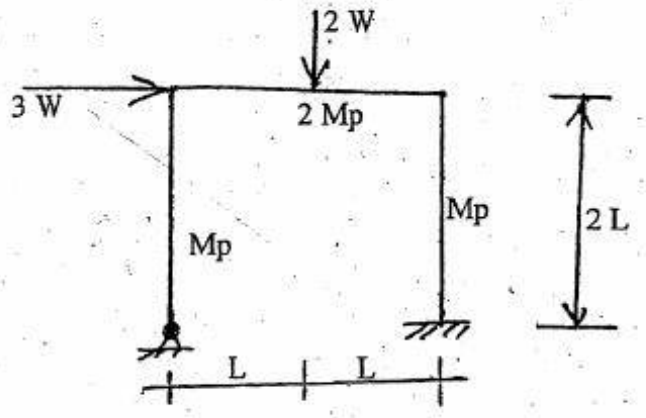
Subject: - Theory of Structure II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

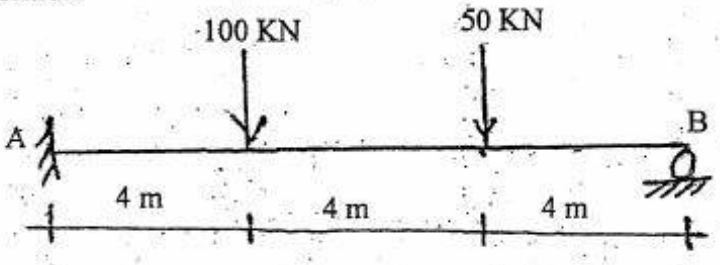
1. a) Draw influence line diagram for moment at support 2 of the continuous beam shown in figure below by using focal point method. Find ordinates at 4 m interval, in span 1-2 and at 2m interval on span 2-3 [6]



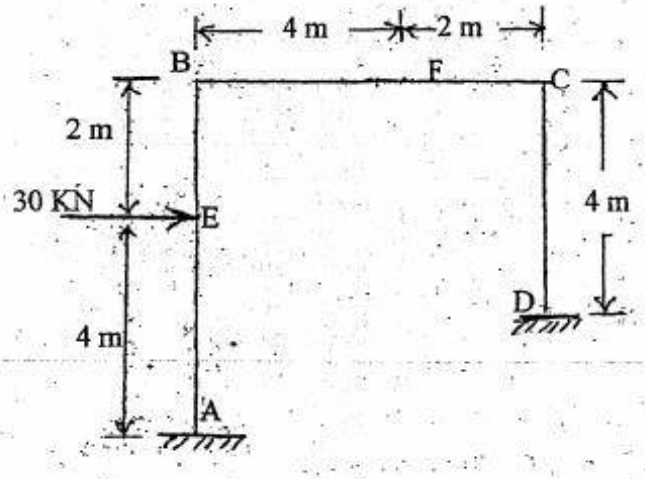
b) Find the collapse load for portal frame shown in figure below. [10]



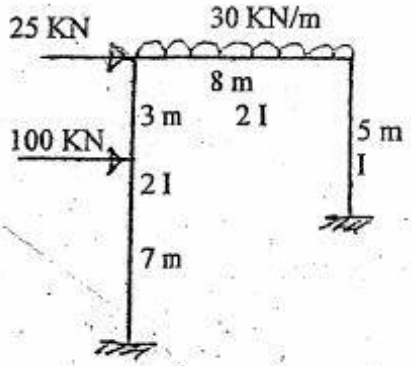
2. a) Determine the moment at fixed support of the propped cantilever beam using Castigliano's method. [6]



b) Generate flexibility matrix to determine the reactions at support D for the frame loaded shown in the figure below. Also determine the reactions at support D and draw bending moment diagram. Show all the steps. [10]

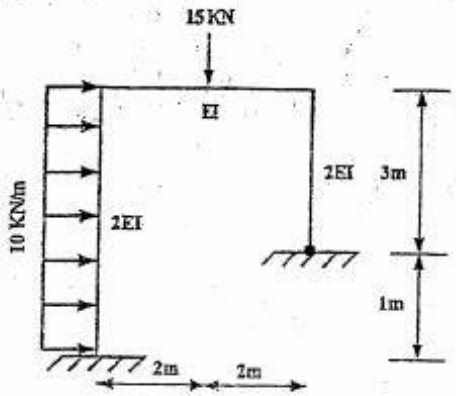


3. a) Analyse the frame shown in figure below by using stiffness matrix method and draw bending moment diagram. [10]



b) List the properties of stiffness and flexibility matrices for a given system. Draw a neat sketch of a system and explain. [6]

4. a) Using the consistent deformation method analyse the frame shown in figure and draw bending moment, shear force and normal thrust diagram. [15]



b) Draw a propped cantilever and write down its boundary conditions. [2]

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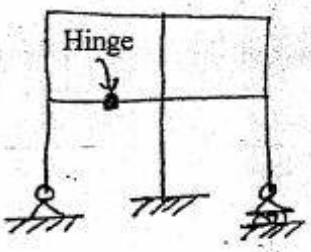
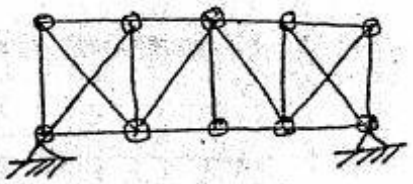
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE601)*

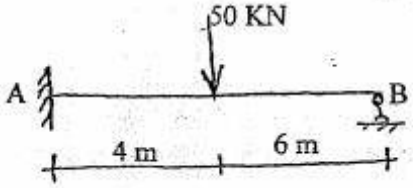
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Obtain the degree of static and kinematic indeterminacies for the given structures. [3+2]

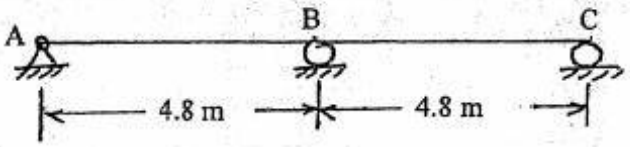




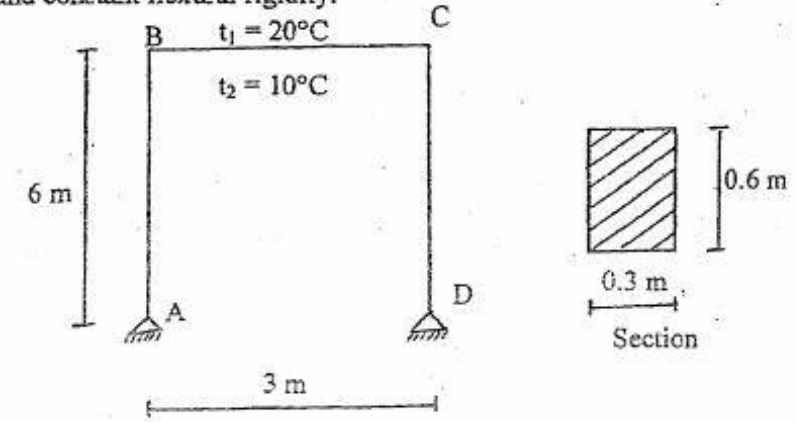
b) Determine reaction at B of the propped cantilever beam shown in figure below using Castigliano's theorem. Also draw bending moment diagram. [10]



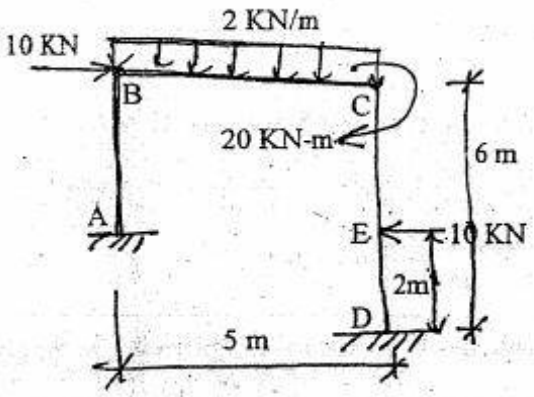
2. a) Explain why flexibility method is called a Force Method. using Force method determine the reactions in the continuous beam shown in figure below, if support B settles 18 mm and support C settles 12 mm. Given EI is constant. E = 232 KN/mm^2, and I = 112.5×10^{6}mm^4. [3+7]



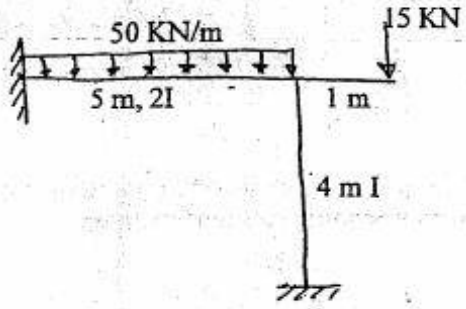
b) Explain the physical meaning of compatibility condition and derive the equation for it. A portal frame with hinged supports is subjected to a temperature variation as shown in figure below. Determine flexibility coefficients and calculate redundant force with the help of compatibility equation. Take $\alpha = 11\times 10^{-6}/°C$, $E = 5000\sqrt{f_{ck}}$, $f_{ck} = 20$ MPa and constant flexural rigidity. [15]



3. a) Generate stiffness matrix for the frame given below. Use the stiffness matrix generated to draw bending moment diagram. Take EI as constant for all members. [15]

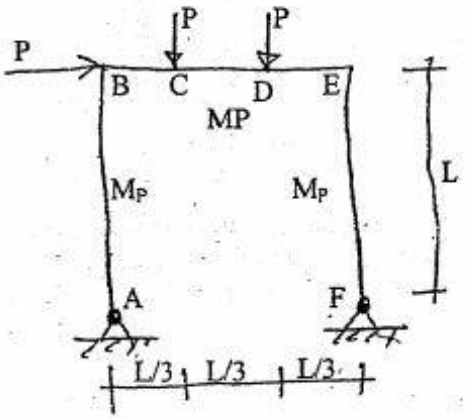


b) Analyse the frame shown in figure below by using moment distribution method. Draw bending moment diagram. [10]



4. a) Explain influence line diagram as system specific diagram. Derive the expression of recurrent formula for focal point ratio considering two consecutive spans for loading on right spans. [5]

b) For the given portal frame with same plastic moment capacity Mp for all members calculate the value of P at collapse. [10]



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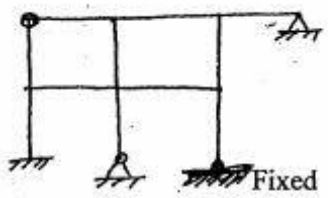
05 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Chaitra

Exam.	Old Back (2065 & Earlier Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(EG622CE)*

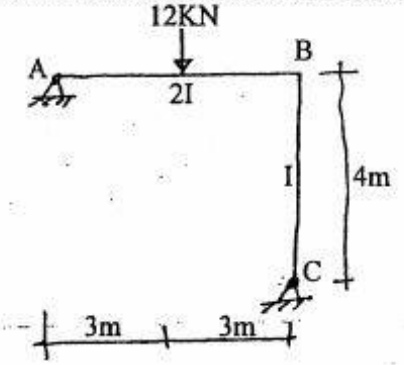
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Four** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Determine degrees of static and kinetic in derminacies for the frame shown below. [6]



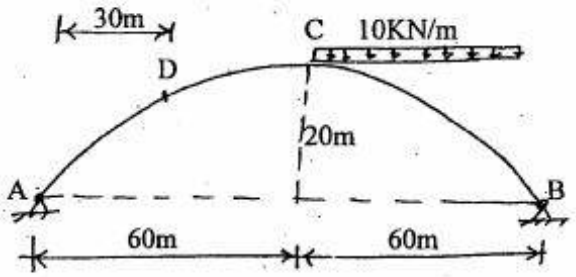
b) Find the reaction at the propped end of a propped cantilever beam of span L and loaded with uniformly distributed load w per unit length over the whole span by using castigliano's theorem. [6]

c) Compute the reactions and draw shear force and bending moment diagram for the frame shown in figure below. Use consistent deformation method. [8]



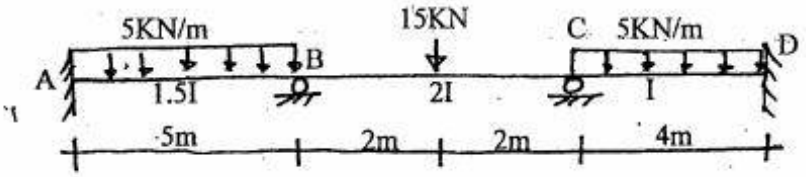
2. a) Explain compatibility conditions. Also describe Maxwell's reciprocal theorem. [2+2]

b) In two hinged parabolic arch shown below, find the values of bending moment normal thrust and radial shear at section D due to the given loading and due to yielding of support B by 10 mm. Take EIc = 100×10^6 KNm^2. I = $I_c \sec\theta$. Also draw bending moment diagram. [16]



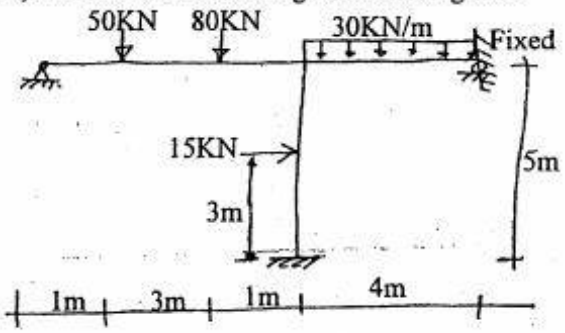
3. a) Define the terms flexibility and stiffness. [2+2]

b) Analyse the continuous beam shown in figure below by slope deflection method. Support B sinks by 7.5 mm. Support A rotates by 5° anticlockwise $E = 5\times10^5$ MPa, $I = 3\times10^7$ mm^4. [16]

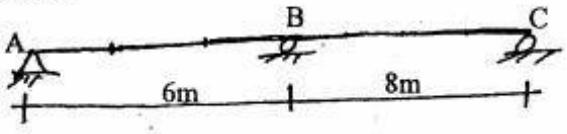


4. a) Define carry over factor and distribution factor. [4]

b) Analyse the frame shown in figure below using moment distribution method. Also draw shear force, axial force and bending moment diagram. [16]



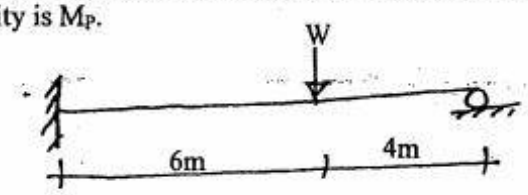
5. a) Define Muller-Breslau principle. Draw influence line diagram for reaction at C. Find ordinates at 2 m interval. [2+8]



b) Define the following terms: [6]

(i) Shape factor (ii) Load factor (iii) Plastic hinge

c) Determine the collapse load for a propped cantilever beam shown below. Plastic moment capacity is M_P. [4]



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Examination Control Division
2070 Chaitra

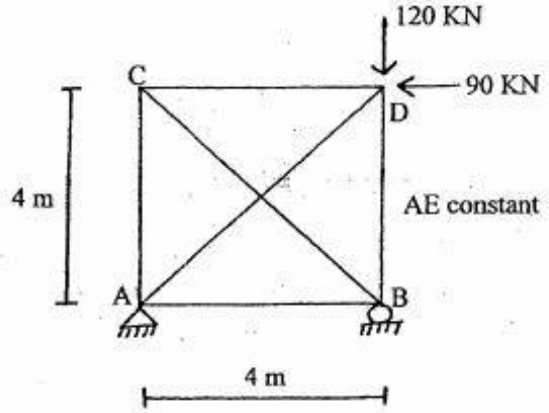
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE601)*

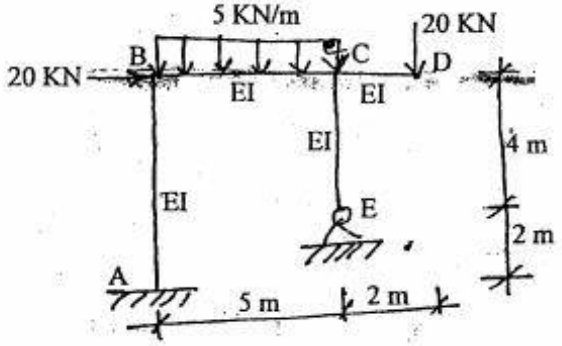
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt <u>All</u> questions.*
- ✓ *The figures in the margin indicate <u>Full Marks</u>.*
- ✓ *Assume suitable data if necessary.*

1. a) Describe different types of indeterminacies of the structural system and their physical meanings. [5]

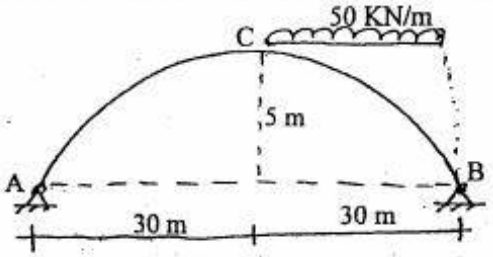
   b) Use castigliano's theorem to determine forces induced in each members of the square truss loaded as shown below. [10]



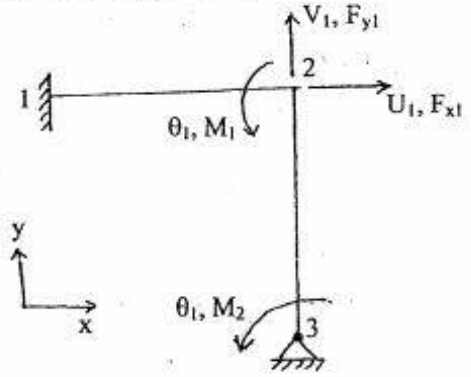
2. a) Draw shear force and bending moment diagrams for the frame given below. Use force method. [15]



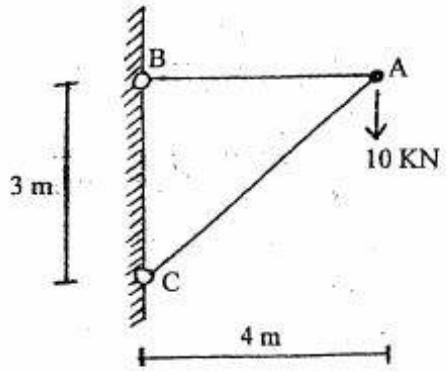
   b) Determine the horizontal reaction in the two hinged parabolic arch shown figure below. Also determine the bending moment at C. ($I = I_c \sec\theta$) [10]



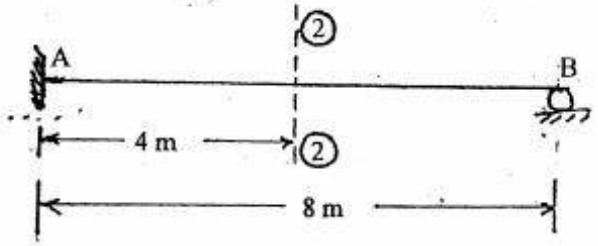
3. a) Describe with example the principle of moment distribution. For the frame shown in figure below generate stiffness matrix that operates on displacements u_1, v_1, $\theta_1$and θ_2. Both members are slender and have the same E, I, A and L. Express matrix coefficients in terms of L, a = AE/L and b = EI/L^3 [5+10]



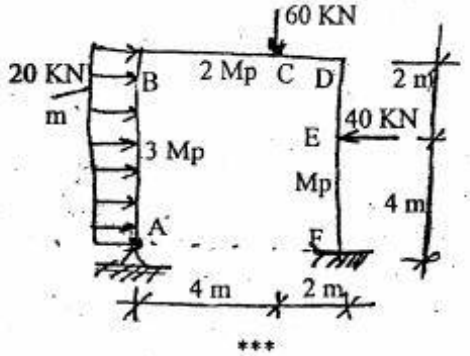
b) A jib-crane is carrying vertical load of 10KN at A as shown in figure below. Determine by matrix displacement method, the displacement of joint A and hence calculate the forces in members AB and AC. Take cross-sectional area of members AB and AC as 10000mm^2 and 20000mm^2 respectively and E = 200KN/mm^2. [10]



4. a) Draw influence line diagram for the shear at section 2-2 of the propped cantilever beam shown in figure below. Find the ordinates at 2 m interval. [5]



b) Find the plastic moment capacity of the frame shown figure below during collapse. [10]



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INSTITUTE OF ENGINEERING

Examination Control Division
2070 Ashad

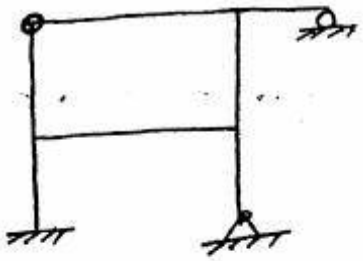
Level		Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE601)*

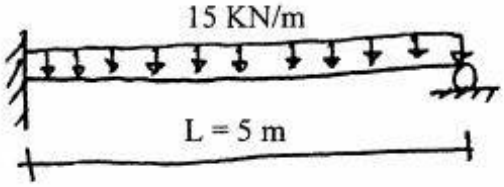
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Define degree of static and degree of kinematic indeterminacies with suitable examples. [4]

   b) Determine the external and internal degrees of static indeterminacy of the structure shown in figure below. Also determine the kinematic indeterminacy. [3+3]

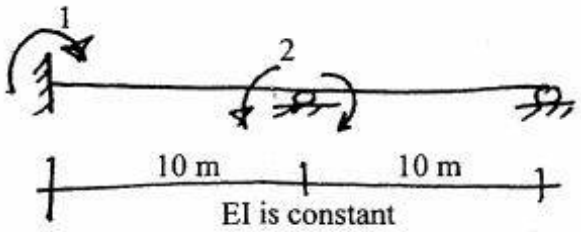


   c) Determine the moment at the fixed end of a propped cantilever beam shown in figure below using Castigliane's theorem. [5]

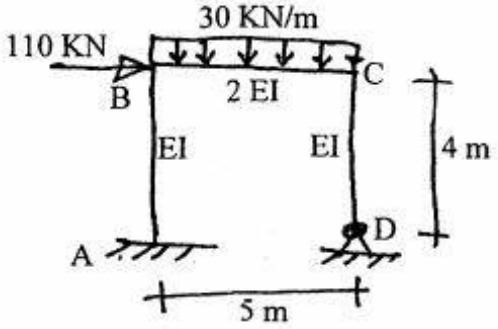


2. a) Define force method and primary structure. [4]

   b) Generate flexibility matrix for the coordinates shown in figure below. [6]

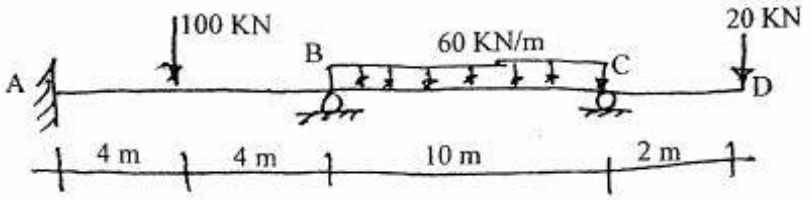


   c) Determine horizontal and vertical reactions at support D of the frame shown in figure below using force method. [10]



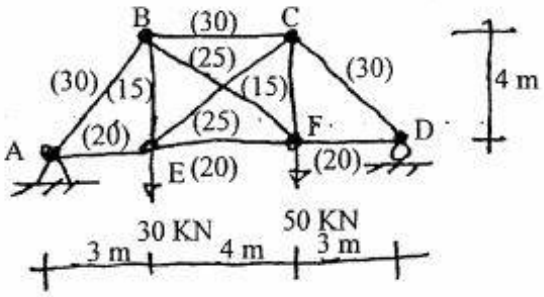
OR

Analyse the continuous beam shown in figure below by using three moment theorem.



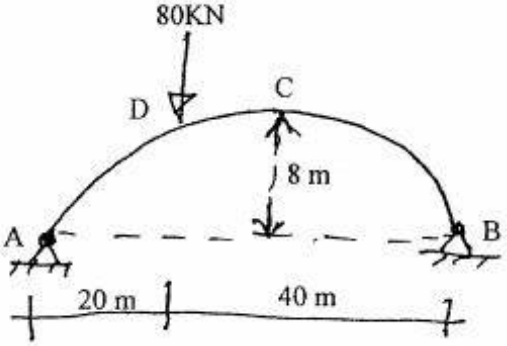
Draw shear force and bending moment diagram.

d) Determine the force in member BF of the redundant truss shown in figure below. Cross section areas of each member in cm^2 are given in figure within brackets. [5]

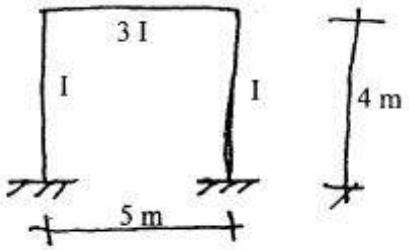


OR

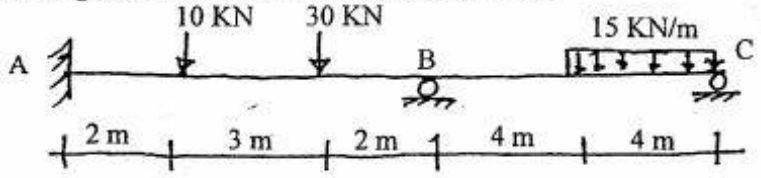
Draw bending moment (BM) diagram for the two hinged parabolic arch shown $I = I_C \text{Sec}\theta$. Calculate the BM value at an interval of 10 m.



3. a) Generate stiffness matrix for the frame shown in figure below. [5]

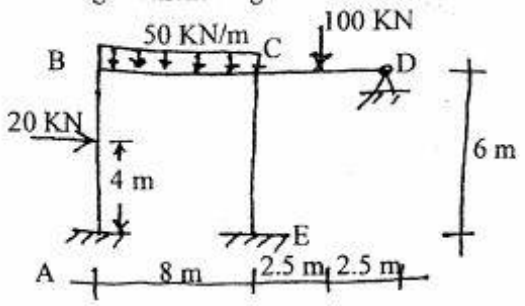


b) Analyse the continuous beam and draw bending moment diagram which is loaded as shown in figure below. Use stiffness matrix method. [10]



70A
TOS-II

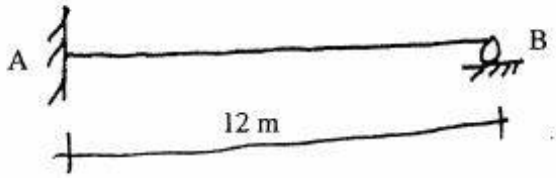
(c) Use moment distribution method to analyse the frame loaded as shown in figure below. Also draw bending moment diagram. [10]



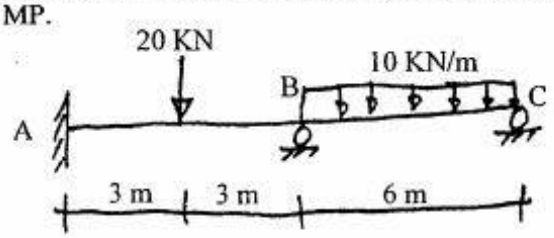
4. Define focal point ratio and derive expression to determine left focal point ratio. [7]

OR

Draw influence line diagram for reaction at support B of the propped cantilever beam shown in figure below. Determine ordinates at 3 m interval.



5. Determine the collapse load for the two span beam shown in figure below if the plastic moment capacity is MP. [8]



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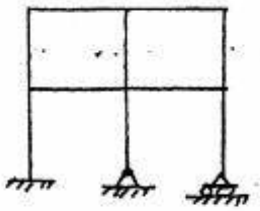
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division.
2069 Ashad

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

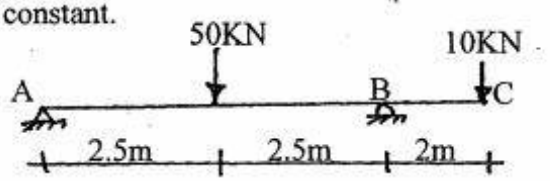
Subject: - Theory of Structure II *(CE 601)*

- Candidates are required to give their answers in their own words as far as practicable.
- *Attempt **All** questions.*
- *The figures in the margin indicate **Full Marks**.*
- *Assume suitable data if necessary.*

1. a) Explain static and kinematic indeterminacies of structures. Determine the degrees of static and kinematic indeterminacy of the structure shown in figure below. (Take all members are inextensible). [2+2+2]

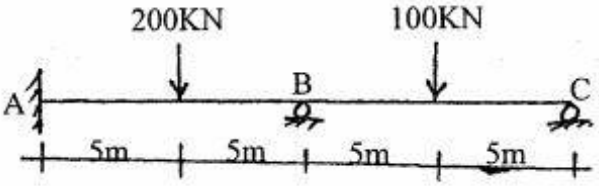


b) Using Castigliano's second theorem. Determine the slope at A of the beam shown in figure below. EI is constant. [4]

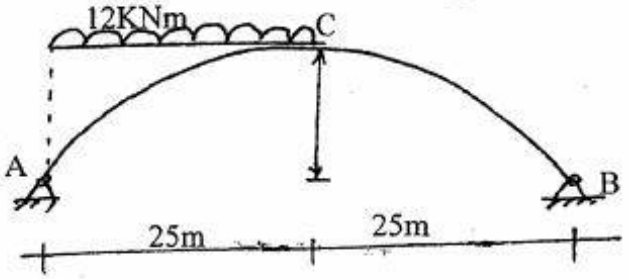


c) Define flexibility and stiffness. What are the properties of flexibility matrix? [2+3]

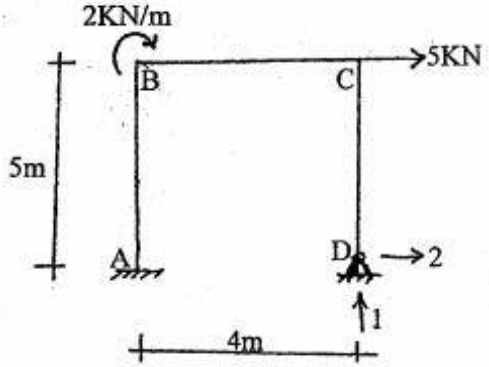
2. a) Use force method(flexibility matrix) to find the reactions at supports B and C of the beam shown in figure below and also draw shear force and bending moment diagrams. [10]



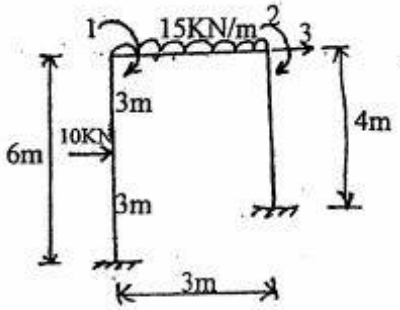
b) A two hinged symmetrical parabolic arch of secant variation cross section having span 50m and rise 8m is loaded with a uniformly distributed load of 12KN/m extending from the left hand support to the centre of the arch as shown in figure below. Determine the horizontal reaction at the support. [5]



c) Generate flexibility matrix for the coordinates shown in figure below and use this to determine the reactions at support D. Take EI is constant for all members. [10]

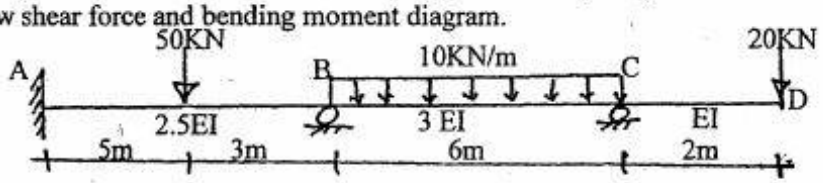


3. a) Generate stiffness matrix for the frame shown in figure below with respect to coordinates 1, 2 and 3 and use it to analyse the frame if the forces 5KNm and 4KN are acting at coordinates 1 and 3 respectively in addition to the external loads as shown in figure below. Take EI is constant for all members. [10]

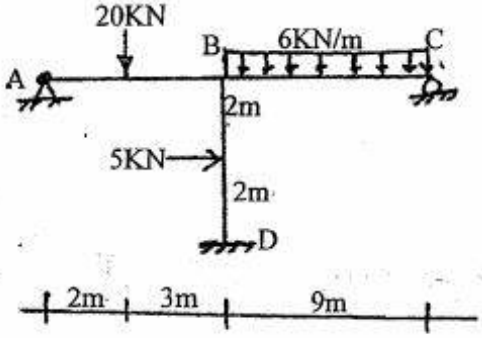


OR

Analyse the continuous beam shown in figure below by slope deflection method. Also draw shear force and bending moment diagram. [10]



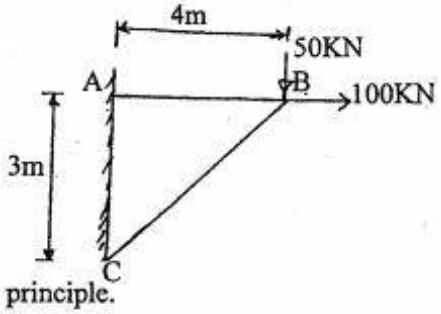
b) Analyse the frame loaded as shown in figure below using moment distribution method and draw bending moment diagram. Take EI is constant. [10]



c) Use displacement method (Stiffness matrix) to find forces in members of the truss shown in figure below. Take axial stiffness for each member to be 400KNcm^{-1}. [5]

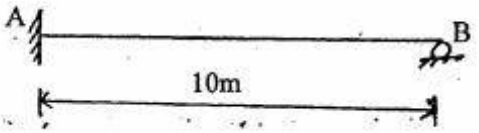
69 A

TOS-D



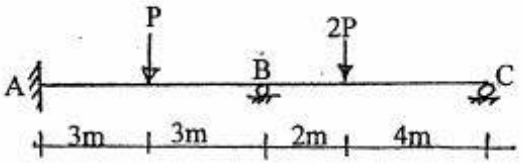
4. a) Define Mueller Breslau principle. [2]

b) Draw influence line diagram for the reaction at B of the propped cantilever beam shown in figure below. Find the ordinates at 2m interval. [5]



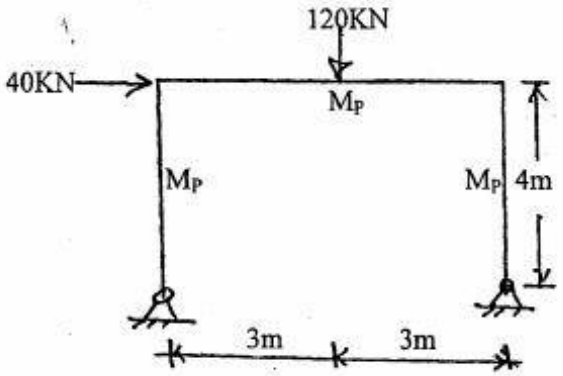
5. a) Define load factor, shape factor and plastic hinge. [3]

b) For the given continuous beam with the same plastic moment of resistance M_P for all the members. Calculate the value of P at collapse. [5]



OR

Calculate the collapse moment after establishing possible failure mechanisms for the portal frame shown in figure below. Use load factor 1.75. [8]



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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2069 Chaitra

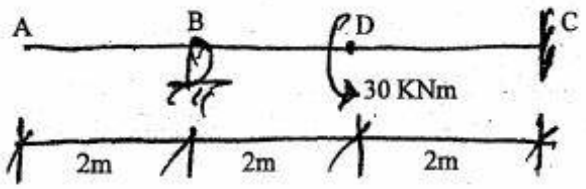
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II *(CE601)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

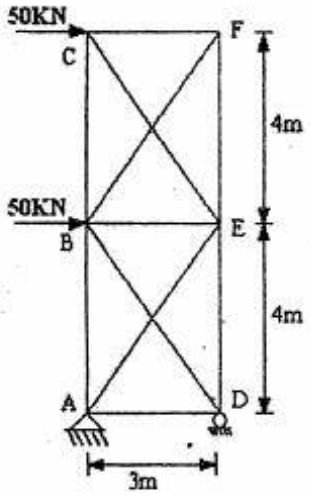
1. a) What is structural idealization? Explain necessary and sufficient condition for stability of a truss. [5]

   b) Use Castigliano's theorem to find moment at point C of the propped cantilever beam loaded as shown in the figure below. Take,EI to be constant. [10]



2. a) Derive expressions for support moments of a single span fixed beam when one end of the beam rotates by an angle θ. Also determine the expressions for support moments of the same beam when one end of the beam settles down by Δ. Assume EI as the cross sectional stiffness and L the span. [7]

   b) Find out member forces in the truss shown in figure below using force method. The axial rigidity of all vertical and horizontal members in EA and that for all inclined member is 2EA. [18]



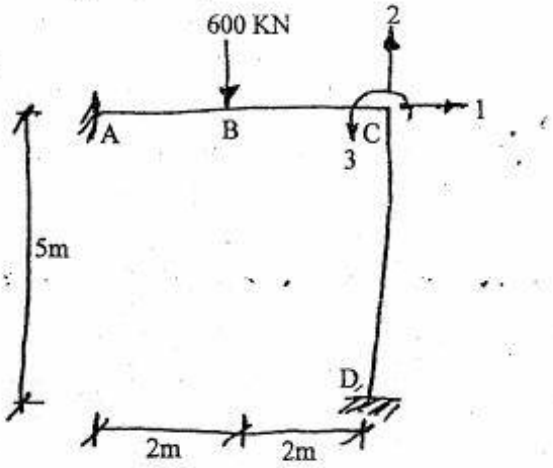
3. a) Derive three moment theorem for a continuous beam and explain its physical meaning. [7]

   b) Determine element stiffness matrices, deformations at joints and member forces. Also draw bending moment diagram, using stiffness matrix method. [18]

$E = 2\times10^5$ MPA

$A = 200\ cm^2$

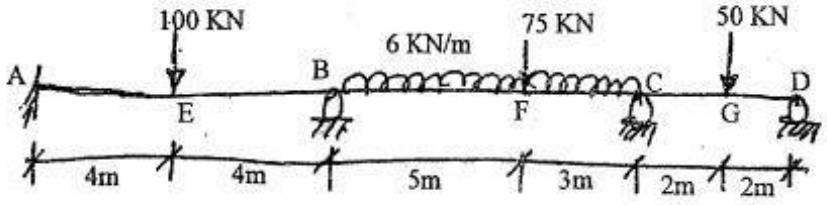
$I = 2.5\times10^5\ mm^4$



4. Define and explain what is neutral point in an unloaded span of a continuous beam. Derive recurrent formula for its determination. [5]

5. a) Enunciate the two basic theorems on methods of limit in plastic analysis. [4]

   b) A prismatic continuous beam ABCD is fixed at A and simply supported at B, C and D. It is subjected to factored loads as shown in figure below. Find collapse mechanism and draw BM diagram. [6]



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01 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Chaitra

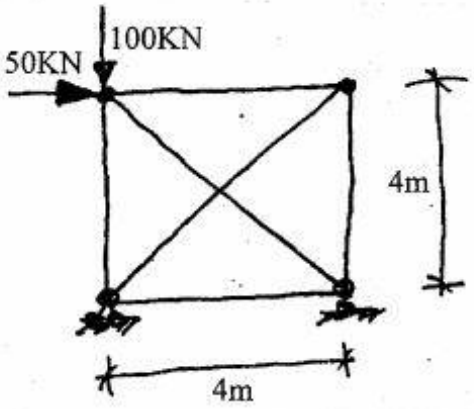
Exam.	Regular		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II *(CE 601)*

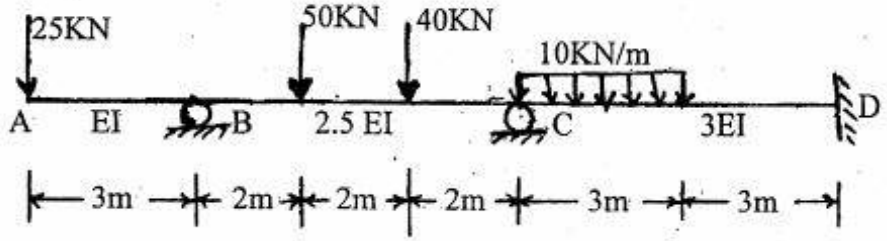
- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Five** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Explain with a simple example the steps to follow in solving a frame using displacement method. [8]

   b) Use force method (flexibility matrix) to solve the truss as shown in figure below. [8]

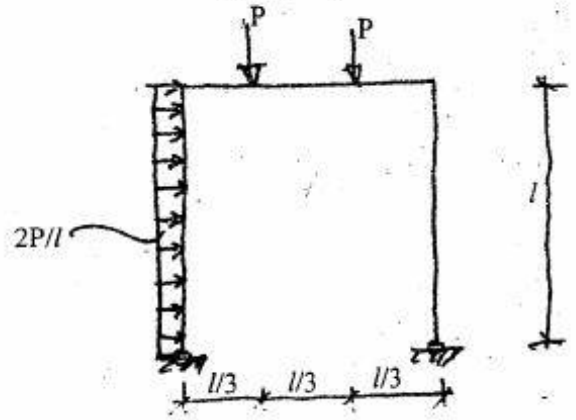


2. Analyse the beam shown in figure below by slope deflection method. Draw BM diagram considering given external loading and rotation of support D by (1/10) clockwise, support C settles down by 4mm. [16]

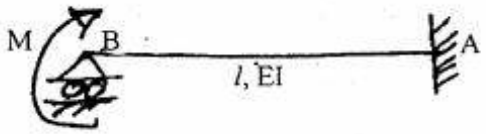


3. a) What is Muceller Breslau principle and how it is used to determine the shape of an influence line diagram of a structural quantity in a statically indeterminate beam? Shown in a simple example. [8]

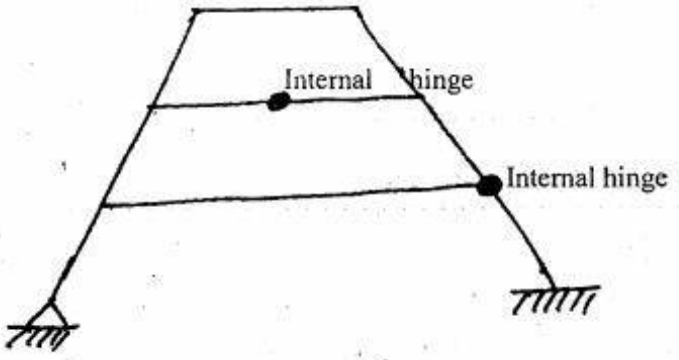
b) For the given portal frame with same plastic moment of resistance M_P for all the members, calculate the value of p at collapse. [8]



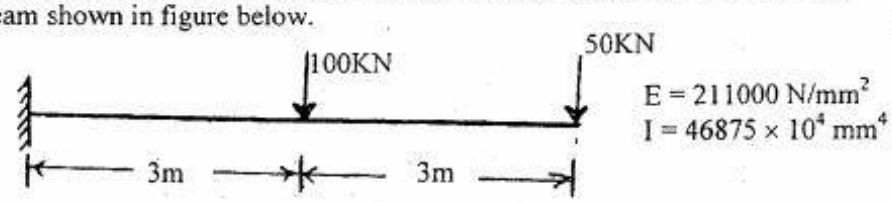
4. a) For the beam as shown, determine the slope at support B. Use Castiglano's second theorem. Take EI = constant. [5]



b) Determine the Static indeterminacy (eternal/internal) and kinematiz indeterminacy for the structure as shown. [3]

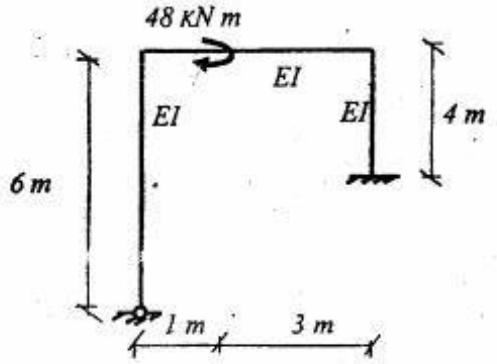


c) Using Castigliano's second theorem, determine the vertical deflection at the 50 KN load in the beam shown in figure below. [8]

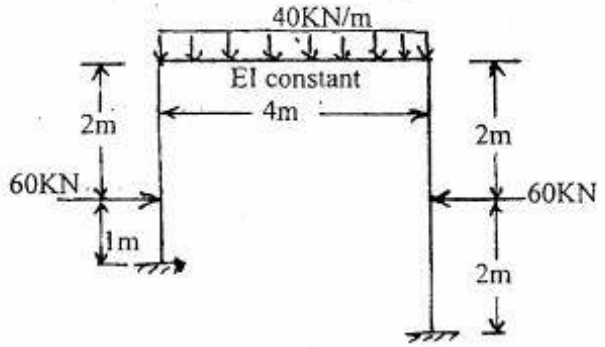


5. a) Enunciate and explain with its uses the two basic theorems on methods of limit analysis in plastic analysis for bending. [8]

b) Use force method (flexibility matrix) to solve the frame as shown in figure below. [8]



6. a) Determine Stiffness matrix for the frame shown in figure below. [8]



b) Draw ILD at 1m interval for support reaction at fixed end of propped cantilever beam of span 5m. Take EI is constant. [8]

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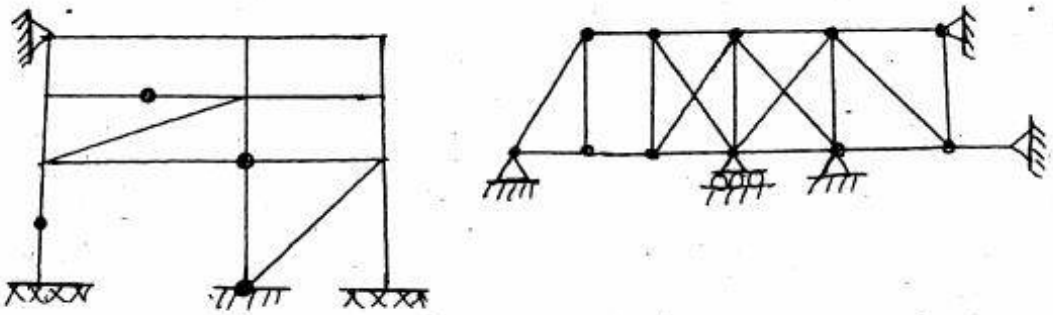
TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Baishakh

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

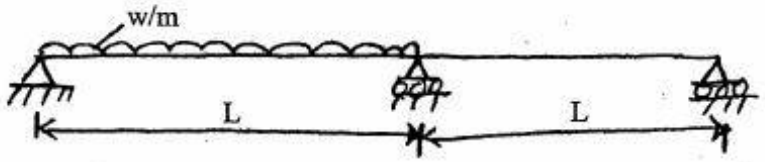
Subject: - Theory of Structures II

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Four** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

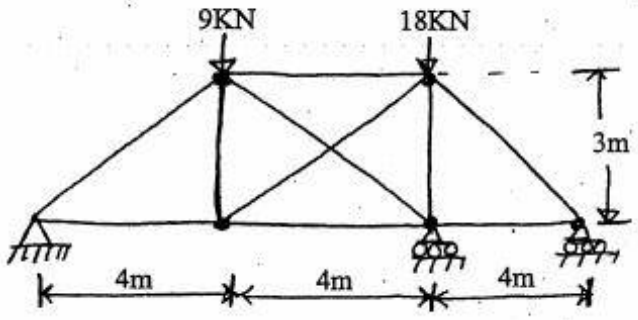
1. a) Determine the external/internal static indeterminacy and kinematic indeterminacy of the structures shown in the figure below. Are they geometrically stable? [10]



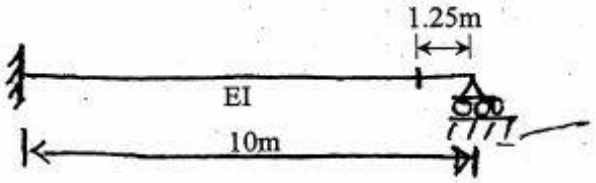
b) Find support reactions of the given loaded beam using Castigliano's theorem. [10]



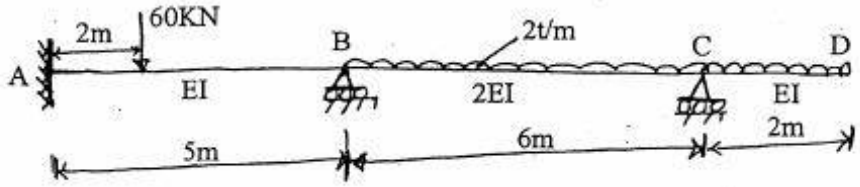
2. Compute the bar forces in all members due to: (i) Given load and (ii) temperature rise by 30°C in the upper chord. Take $E = 2 \times 10^5$ N/mm^2, $\alpha = 10.8 \times 10^{-6}$/°C. Take area of all members to be 30cm^2. [12+8]



3. a) Draw influence line diagram for bending moment at fixed support of the beam and obtain ordinates at each 1.25m interval. [10]



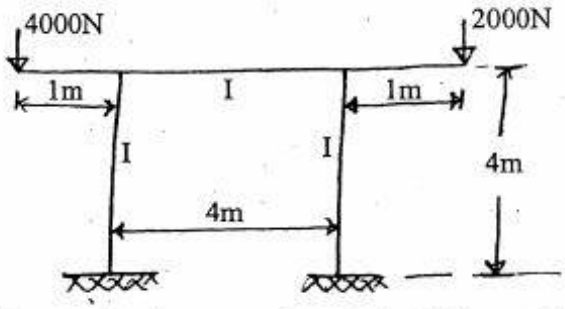
b) Using slope and deflection method, find support moments and draw bending moment diagram for the given beam. [10]



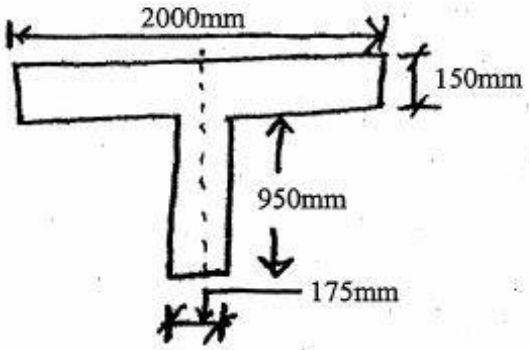
Support A sinks by 1cm
Support C sinks by 1.5cm

Take, $E = 2 \times 10^5$ MPa, $I = 10{,}000$ cm^4.

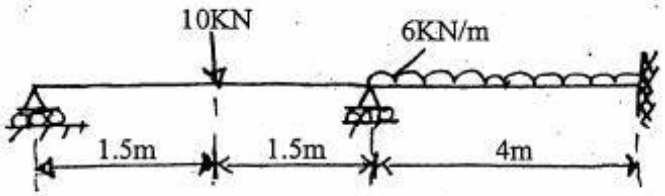
4. Draw axial force, shear force and bending moment diagram for the given loaded frame. Use moment distribution method. [20]



5. a) Define shape factor and write properties of plastic hinge. Find shape factor of the given T - beam section. [10]



b) Using stiffness matrix method, find support reactions and draw bending moment diagram for the given loaded continuous beam. [10]



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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2067 Ashadh

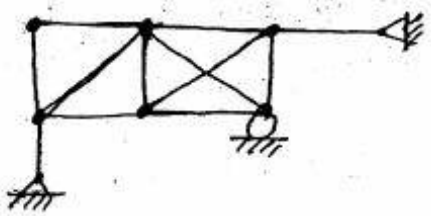
Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structure II

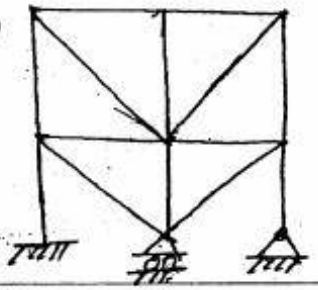
- Candidates are required to give their answers in their own words as far as practicable.
- *Attempt any **Four** questions.*
- *The figures in the margin indicate **Full Marks**.*
- *Assume suitable data if necessary.*

1. a) Determine the external/internal static indeterminacy and kinematic indeterminacy of the structures shown in figure below. Are they stable or unstable? [5]

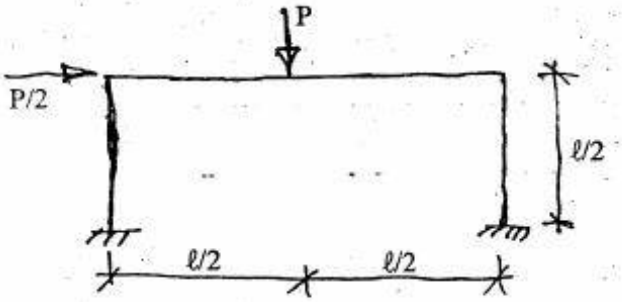
i)



ii)

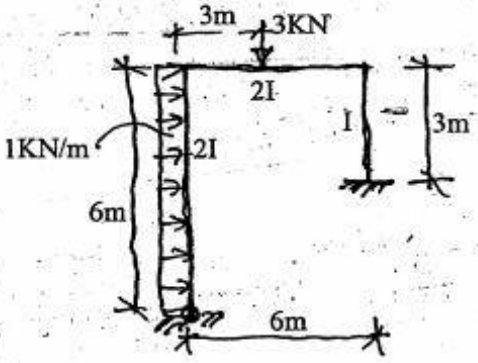


b) For the frame shown calculate collapse value of 'P' assuming M_P as the plastic moment of resistance for all the member. [15]



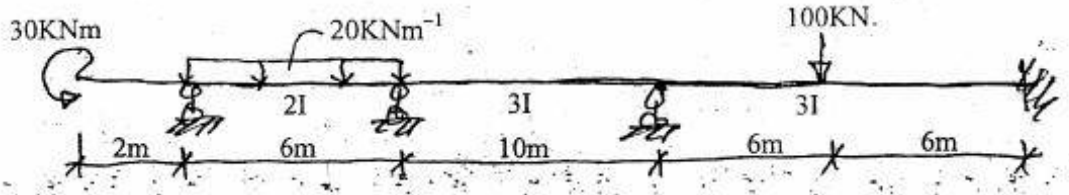
2. a) Explain Cartigliano's theorem for determination of displacement in a structural system and prove it. [5]

b) Use consistent deformation method to solve the frame and draw bending moment, shear force and normal thrust diagrams. [15]



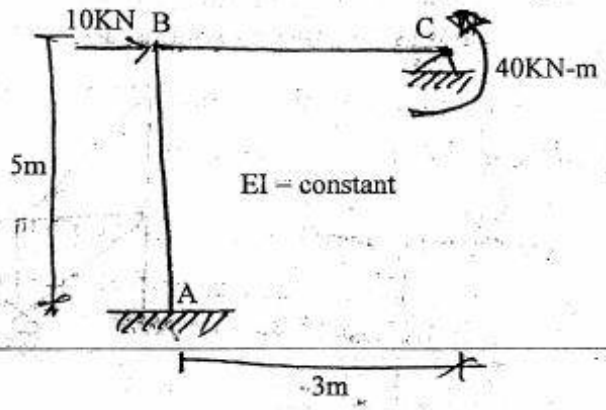
3. a) What is the consistent deformation method? Derive the formula. [5]

b) Use slope deflection method to draw bending moment and shear force diagrams of the beam. [15]



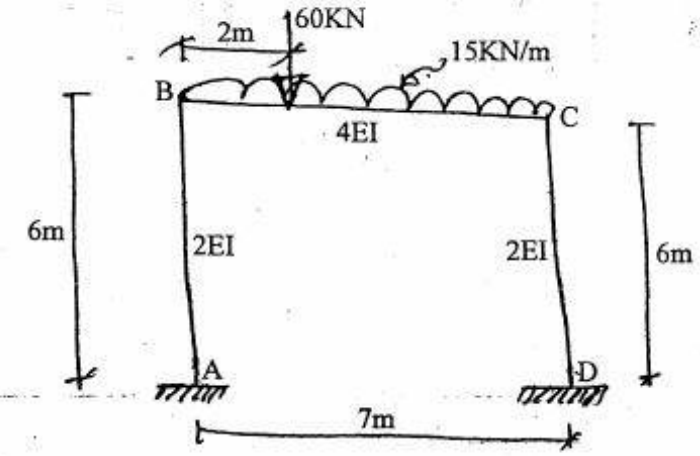
4. a) Explain about cases of symmetry and anti symmetry. [5]

b) Analyze the frame shown in figure using stiffness method (displacement method). Consider only flenural deformations and take EI as constant throughout. [15]



5. a) Explain Muller Breslau principle for influence line diagram and show in an example how it is applied. [5]

b) Analyze the frames shown in figure by moment distribution method. Also draw AFD, SFD, and BMD for the structure. [15]



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06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Jestha

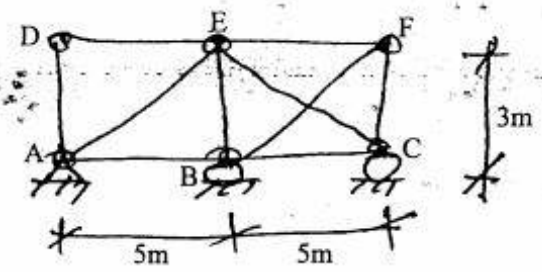
Exam.	Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Four** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Determine forces in bars BC and BF of the truss shown below, if all inclined members are found to be 2mm too long and all vertical members are subjected to a decrease in temperature of 15°C. Area of cross-section of all members is 40cm^2. [20]

   Take e = 2×10^5 N/mm^2, $\alpha = 10.8\times10^{-6}$/°C

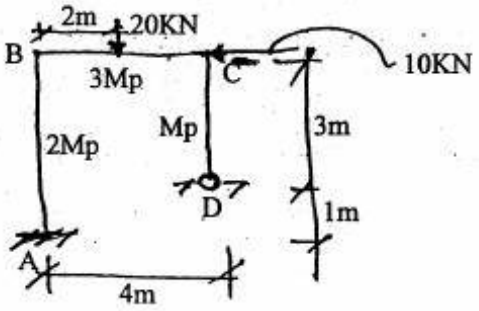


2. A three-spanned continuous beam is fixed at both extreme ends. The left span is of sectional stiffness EI and is loaded with a uniform distributed load of intensity 2 kN m^{-1}. The mid span is of stiffness 2 EI and has a vertical concentrated force of magnitude 5 kN applied at a point 2m from the right end. The right span is of sectional stiffness EI and is centrally loaded with a vertical concentrated force of magnitude 8 kN. The left span is of length 6m and the other two are of 5m. The left middle support settles 2mm down and right middle support is lifted 3mm up. Analyse using slope deflection method and draw bending moment diagram for the beam if all the forces being applied are directed vertically downward. Take EI = 8×10^{11} N-mm^2. [20]

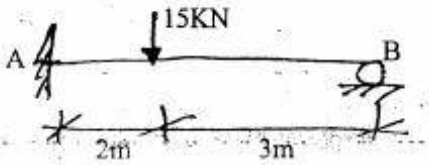
3. A single spanned one storeyed rectangular frame of span 6m is fixed at the bases and has beam of sectional stiffness 4 EI and columns of 2 EI with storey heights 4m. Two horizontal concentrated forces of magnitude 25 kN and 50 kN, directed towards right, are acting at the beam column joint and at the middle of the left column respectively on the left side. Use moment distribution method to draw bending moment diagram for the frame. [20]

4. a) A two spanned continuous beam is pinned at the ends. The relative cross-sectional stiffnesses and spans for the left and right beams are 2 EI and 5 EI and 2m and 6m respectively. Draw influence line diagram for the moment at the mid support showing ordinates at every 2m interval. [12]

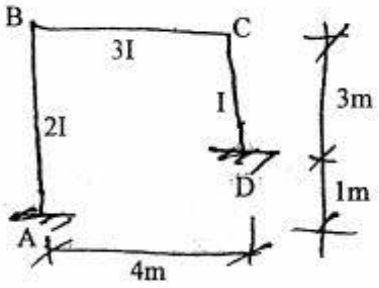
b) Determine the value of plastic moment capacity Mp for the frame loaded as follows: [8]



5. a) Use Castigliano's theorem and find the moment at the fixed end of the propped cantilever loaded as shown below. EI is constant. [10]



b) Generate stiffness matrix for the frame shown below. [10]



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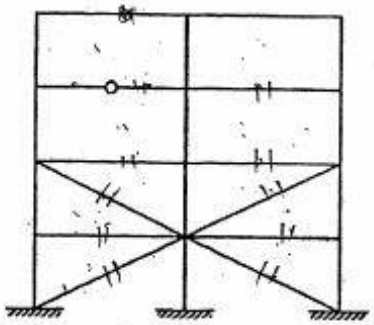
06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2066 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Theory of Structures II

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Four** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

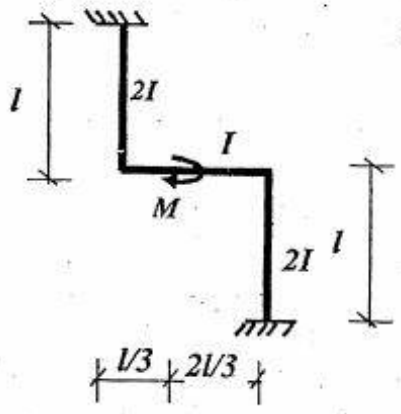
1. a) Compute Static Indeterminacy, Kinematic Indeterminacy and Stability of the structures shown in figure given below. [10]



Axial deformation of the members are neglected.

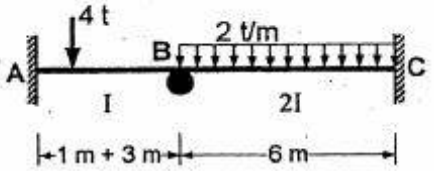
b) Compute the maximum central vertical deflection for a simply supported beam of span L loaded with a uniformly distributed load of w/unit length, EI is constant. Use Castigliano's theorem. [10]

2. a) Use consistent deformation method to draw bending moment diagram of the chair-frame loaded with a couple as shown. Take $E = 2 \times 10^4$ MPa, $\ell = 3$m, M = 50 kNm and $I = 4.5 \times 10^8 mm^4$. Also draw shear force and normal thrust diagrams corresponding to the bending moment diagram. [10]

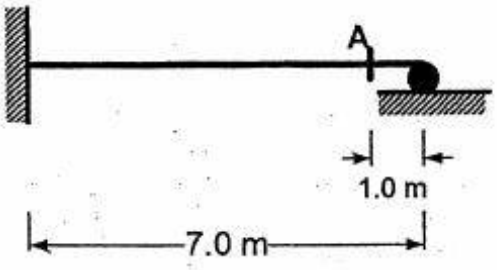


b) A rectangular horizontal truss of span 12m and height 9m is with two diagonals and is supported by two hinges fixed at the base. A horizontal force of magnitude 100 kN is acting toward the truss at the left top joint. The diagonal connecting the loaded joint was manufactured 2cm shorter than the assigned length. Calculate the forces induced in every member assuming Young's modulus and cross-sectional areas of the every member to be 2×10^5 MPa and $1000 mm^2$ respectively. [10]

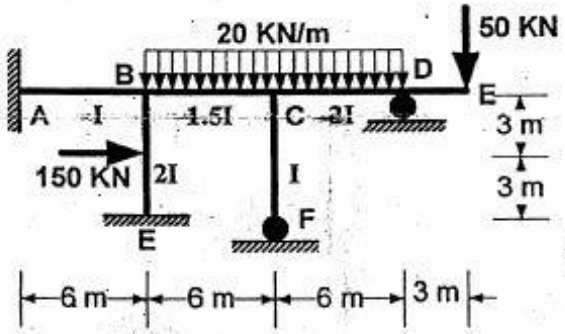
3. a) Determine the member end moments using slope deflection method and draw BMD and SFD for the beam loaded as shown in figure given below. Support B settles down by 5mm and Support C rotates clockwise by 0.02 radian and EI is 20 t/mm^2. [10]



b) Draw Influence Line Diagram for Shear Force at A of the propped cantilever beam shown below. Calculate ordinates at 1.0m interval. [10]

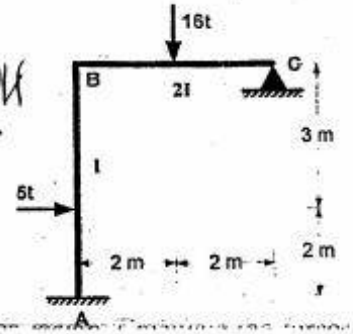


4. Analyze the frame loaded as shown in figure given below. Use Moment Distribution Method. Draw BMD and SFD. [20]



5. a) A single spanned fixed beam of length 9m has two concentrated forces applied vertically downwards at 3m distance from each ends. The left and right forces are 60kN and 120kN respectively. Calculate the section modulus required to render system into collapse condition, if the yield stress and load factor for the materials used are 250 MPa and 1.15 respectively. [10]

b) Analyze the frame given below with inextensible members using stiffness method. [10]



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5-23

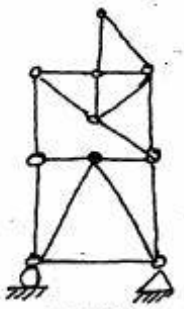
06 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2065 Shrawan

Exam.	Regular/Back		
Level	BE	Full Marks	80
Programme	BCE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

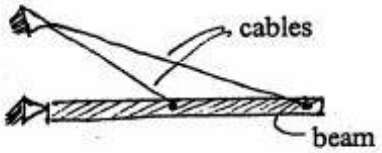
Subject: - Theory of Structures II

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt any **Four** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. a) Find static and kinematic indeterminacy for the following structures with all extensible members: [3+3]

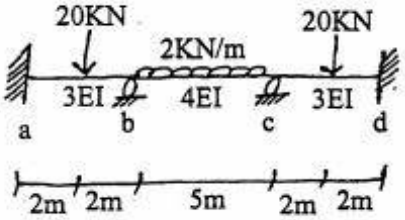


TRUSS

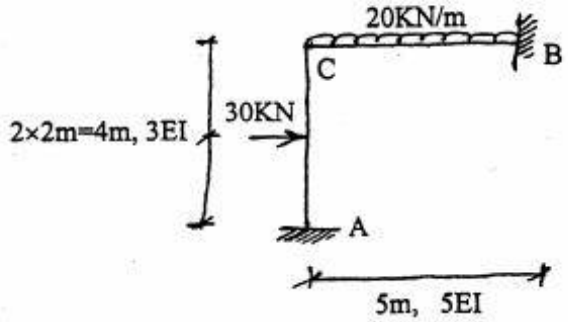


BEAM CABLE

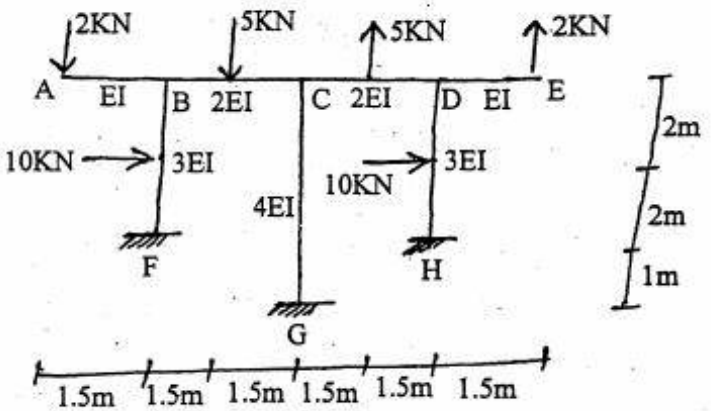
b) Use slope-direction method to analyze the continuous beam shown in the figure. Draw free body diagram BMD and SFD. The support "a" rotates by 0.001 radian clockwise and support "b" rotates by 0.001 radian anticlockwise. Support "b" and "c" both settle down by 10mm. [14]



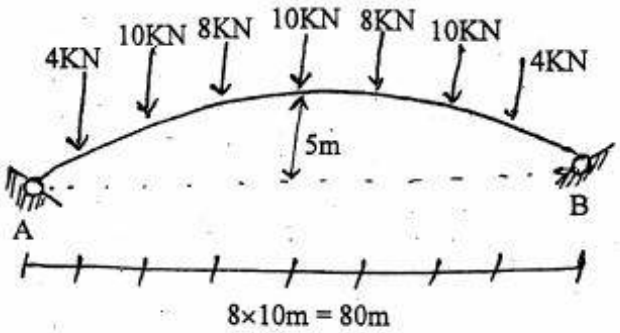
2. Use consistent deformation method to analyze the bent frame shown in the figure below. Draw Axial Force Diagram, Shear Force Diagram, and Bending Moment Diagram for the shown system, if support A settles down by 10mm; shifts towards left by 10mm and rotates clockwise by 0.002 radians. [20]



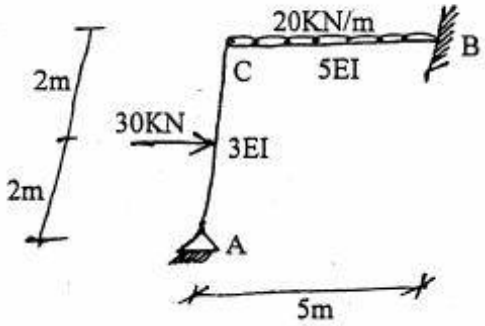
3. Use moment distribution method to analyze the frame shown in the figure. Draw Axial Force Diagram, Shear Force Diagram and Bending Moment Diagram for the system. [20]



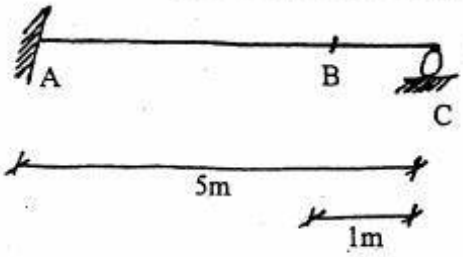
4. a) For the parabolic two hinged arch loaded symmetrically with concentrated loads as shown in the figure, determine the horizontal reaction. Use secant variation of moment of inertia. [8]



b) Analyze the bent frame using stiffness method and find member end moments. Members are inextensible. [12]



5. a) Use Muller Breslau Principle and draw influence line diagram with ordinates at 1m interval for the shear force at B, of the beam shown in the figure. [10]



b) List the differences between elastic and plastic analysis. What is meant by Plastic Hinge? [5+5]

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