## II B.TECH - II SEMESTER EXAMINATIONS, APRIL/MAY, 2011 <br> STRUCTURAL ANALYSIS-I (CIVIL ENGINEERING)

Time: 3hours

Max. Marks: 75

## Answer any FIVE questions All Questions Carry Equal Marks

1. A 3-hinged parabolic arch of horizontal span 20 m , central rise 4 m carries a u.d.l. of $20 \mathrm{kN} / \mathrm{m}$ on the left 8 m length starting from the left support hinged. Obtain the normal thrust and radial shear at 4 m from left end. Find the maximum +ve and -ve B.Ms. Sketch the B.M.D.
2. A 3-span continuous beam $A B C D$ has fixed end supports. On end span $A B=6 \mathrm{~m}$ there is u.d.l. of $20 \mathrm{kN} / \mathrm{m}$, while on $\mathrm{CD}=5 \mathrm{~m}$ there is a point load of 80 kN at mid span on the central span $\mathrm{BC}=5 \mathrm{~m}$, there is a point load of 50 kN at 3 m from B . If the moment of inertia of BC is twice that of AB and CD analyse by moment/distribution method and sketch the B.M.D.
3. If support B of the continuous beam of Question No. 2 settles by 30 mm , obtain the support moments by slope deflection method, taking $I=400 \mathrm{~cm}^{4}$ and $E=2 \times 10^{5} \mathrm{~N} / \mathrm{mm}^{2}$. Sketch the B.M.D.
4. State Castigliano Theorem I. Using the same obtain the deflection at mid span and slope at left end of a simply supported beam of span L due to a central point load W . (EI= constant).
5. A u.d.l. of intensity " $w$ ", of length " $c$ " shorter than span $L$ of a simply supported girder crosses from left to right. Construct the maximum S.F. and maximum B.M. diagrams making the salient values.
6. Sketch the influence line diagram for S.F. and B. M. at 4 m from the left end of a simplysupported girder of span 10 m . Hence find the maximum S.F. and maximum B.M. at the section if two wheel loads of 8 kN and 16 kN spaced 2 m apart move from left to right.
7. a) Explain the difference between " Static" and "Kinematic" indeterminacies.
b) State and explain Castigliano's Theorem II and its application.
8. Using stiffen-method obtain the support moments for the 2-span continuous beam shown below. Sketch BMD.


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1. A 3-hinged parabolic arch of horizontal span 20 m , central rise 4 m carries a point load of 40 kN at 4 m for the left hinge. Calculate the normal thrust and radial shear just left of the load. Find also the maximum +ve and -ve B.Ms. and sketch the B.M.D.
2. A 2-span continuous beam ABC having simply-supported ends carries a point load of 50 kN at 3 m from a A on span $\mathrm{AB}=5 \mathrm{~m}$, on $\mathrm{BC}=5 \mathrm{~m}$ there is a point load of 80 kN at mid-span. Using slope - deflection method obtain the support moments and sketch the B.M.D.
3. If the support $B$ of the continuous beam $A B C$ of Question No. 2 settles by 10 mm obtain the support moments by moment distribution method if $\mathrm{E}=2 \times 10^{5} \mathrm{~N} / \mathrm{mm}^{2}$ and $\mathrm{I}=400$ $\mathrm{cm}^{4}$. Sketch the B.M.D.
4. A simply supported beam of span L carries a u.d.l. of "w" per unit length over the entire span. Find the deflection at mid span and slope at left end by Castigliono Theorem I (EI=Constant).
5. Two wheel loads, $w_{1}$ and $w_{2}$ spaced "a" apart cross a simply-supported girder of span $L$, from left to right. Sketch the maximum B.M and maximum S.F diagram making the salient values.
6. Illustrate the procedure to find the forces in the members of a Pratt truss due to moving loads using the influence line diagrams.
7. Find the forces in all the members of the frame loaded as shown below, treating one of the diagonals as redundant. $(\mathrm{EA}=$ Constant $)$.
8. Analyse the pin-jointed frame loaded as shown in figure by the stiffness method. Find the force in any one of the diagonal member. All members have the same cross sectional area.


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1. A semi circular arch of radius $R$ has 2- hinges at its supports. Find the horizontal thrust and reaction at hinges due to a point load W at crown. Find the B.M. at crown. Sketch the B.M.D making the salient values.
2. A 2-span continuous beam ABC is loaded with a u.d.l. of $20 \mathrm{kN} / \mathrm{m}$ on left span $\mathrm{AB}=6 \mathrm{~m}$. On $\mathrm{BC}=6 \mathrm{~m}$ there is a point load of 120 kN at mid-span. If the ends A and C are fixed obtain the support moments using moment distribution method. Sketch the B.M.D.
3. If the support $B$ of the continuous beam $A B C$ Question No. 2 sides by 10 mm find the support moments by slope deflection method, taking $\mathrm{E}=2 \times 10^{5} \mathrm{~N} / \mathrm{mm}^{2}$ and $\mathrm{I}=400 \mathrm{~cm}^{4}$. Sketch the B.M.D.
4. Using Castigliano theorem I, find the vertical deflection at the free end $B$ of the perfect cantilever truss ABC , due to the vertical load W at B as shown below figure 1. (EI=Constant).


Figure: 1
5. a) What do you understand by "Enveloping parabola" and "equivalent u.d.l."
b) Obtain the equivalent u.d.l. for a simply supported girder of span 16 m on which two wheels loaded of 4 kN and 6 kN , spaced 6 m apart, move from left to right with the smaller load leading.
6. Illustrate the procedure to find the forces in horizontal and inclined members of a warren truss using influence line diagrams.
7. a) Explain the difference between "internal" and "external" indeterminacies with the help of sketches for "one" and "two" degrees.
b) Illustrate the analysis of 2- degrees internally indeterminate frame.
8. Using flexibility method finds the support movements for the 2-span continuous beam loaded as shown below figure 2. Sketch the B.M.D.


Figure: 2

## SET No - 4

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Time: 3hours
Max. Marks: 75

## Answer any FIVE questions All Questions Carry Equal Marks

1. A 2-hinged semi-circular arch of radius R carries a u.d.l. of "w" per unit length over its entire span. Find the horizontal thrust, reactions at support hinges. Find the B.M. at crown.
2. Using moment distribution method, analyse the 2 -span continuous beam ABC , having end supports A and C fixed. There is a load of 5 kN in span $\mathrm{AB}=5 \mathrm{~m}$ at 3 m from A , while on span BC there is a load of 8 kN at 2.5 m from C. Sketch the B.M.D. ( $\mathrm{EI}=$ Constant).
3. If the end spans $A$ and $C$ of the beam given in Question No. 2 are simply supported analyse using slope deflection method. Sketch the BMD.
4. Find the vertical deflection of the joint $C$ of a simply supported triangular truss, ABC (pin-jointed) carrying a point load $W$ at $C$. All members are of equal length $L$ and EI $=$ Constant.
5. a) A single wheel load $W$ moves on a simply supported girder of span $L$ from left to right. Obtain the maximum S.F and maximum B.M diagrams. Mark the salient values.
b) Explain the term "Focal Length".
6. A u.d.l. of intensity $10 \mathrm{kN} / \mathrm{m}$ and 4 m long crosses a simply supported girder of 12 m span. Sketch the I.L. diagrams for S.F. and B.M. at $1 / 3$ span. Hence find the maximum S.F. and B.M. at the section. Find also the absolute maximum S.F. and B.M.
7. Find the forces in the 3 members of the frame subjected to horizontal load heating vertical member AC as redundant. (EA=Constant) $(\mathrm{AC}=\mathrm{L})$.
8. Determine the degrees of static and kinematic indeterminacies of the pin-jointed frame shown in figure. Analyse the pin-jointed frame by the flexibility method and find the force in any one member if $\mathrm{L}=3 \mathrm{~m}$ and the areas of members $\mathrm{AB}, \mathrm{AC}, \mathrm{AD}$ are 18,6 and $12 \mathrm{~cm}^{2}$ respectively.

