Code No: RR220104 **Set No. 1**

II B.Tech II Semester Supplementary Examinations,
November/December 2005
STRUCTURAL ANALYSIS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Draw the bending moment diagram and locate the point of inflections for the propped cantilever beam shown in Figure 1. [16]

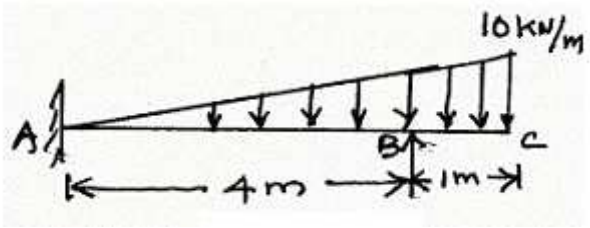

Figure 1:

2. A fixed beam of span 12 m carries two point loads 100 kN and 150 kN at distances 4m and 8m from the left end. Find the fixed end moments and reactions at the supports and draw the B.M.D. and S.F.D. [16]

3. The pin jointed truss shown in Figure 2 is loaded with two point loads of 20kN and 10kN at the upper joints. Evaluate the forces in the members using the method of tension coefficients. [16]

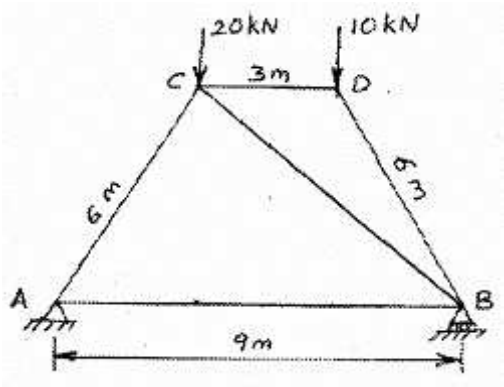

Figure 2:

4. Analyse the continuous beam shown in Figure 3 by Clapeyron's theorem of three moments, if support B sinks by 8mm. Also sketch the BMD, SFD and elastic curve. Take E = 200 kN/mm^2 and I = 0.8 x $10^8 mm^4$. [16]

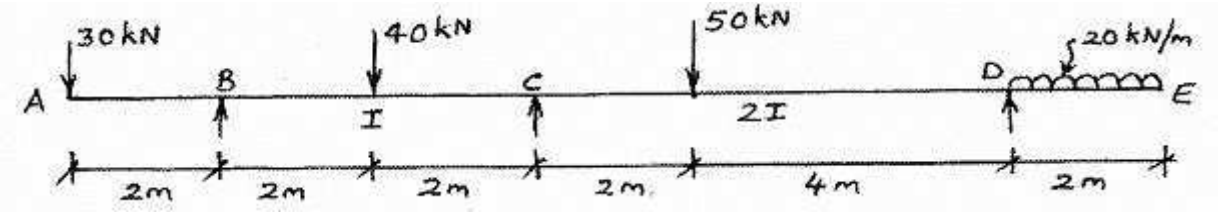

Figure 3:

5. State and explain Castigliano's first theorem taking any example. [16]

6. A train of concentrated loads as shown below move form left to right on a simply supported girder of span 16m, with the 40kN load leading
   Wheel load(kN) : 20 60 80 40
   Spacing (m) : 3 2 2
   Determine the absolute maximum shear force and bending moment developed in the beam. [16]

7. A beam ABC is supported at A,B and C and has an internal hinge at D at a distance of 3m from A. AB=6m and BC=9m .Draw the influence lines for the reactions at supports and S.F and B.M at a point 1m from B in the span BC. [16]

8. (a) Differentiate between the statically determinate structures and critically indeterminate structures.
   (b) Analyse the frame shown in Figure 4. Members AB and AD have area of $800mm^2$ and member AC has area of $400mm^2$ take E = $2\times10^5 n/mm^2$.[6+10]

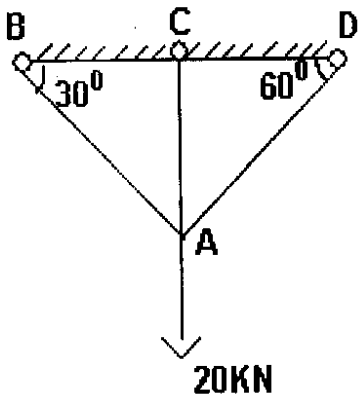

Figure 4:

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Code No: RR220104 **Set No. 2**

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STRUCTURAL ANALYSIS-I
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Time: 3 hours **Max Marks: 80**

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1. Draw the bending moment and shear force diagram of a propped cantilever beam of span 6m due to a point load of 6 kN at the mid span. [16]

2. Find the fixed end moments for a fixed beam of span 6 m subjected to a concentrated clockwise moment of 10 kNm at 2.5 m from the left end. [16]

3. Three flexible wires AO, BO and CO are attached at their upper ends to a rigid horizontal plane and are just tight in the positions shown in Figure 1, when no load is applied at O. Determine the tension in each wire when a load of 5kN is applied at O. Use the method of tension coefficients. [16]

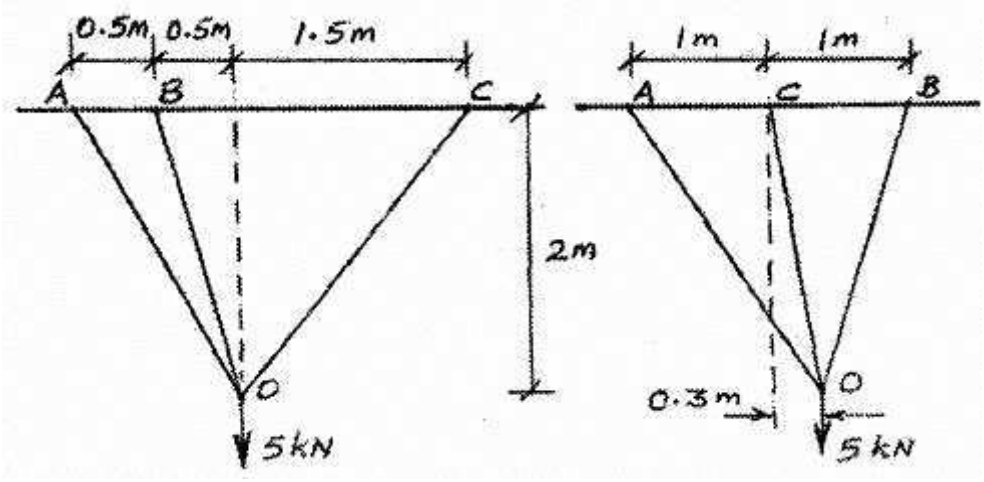

Figure 1:

4. Determine the support moments and reactions for the three span continuous beam shown in Figfure 2 using Clapeyron's theorem of three moments. Assume EI as constant. Also sketch the BMD and SFD. [16]

5. Determine the vertical displacement of joint C of the truss . Cross sectional area of each member A= $300mm^2$, E= $2x10^5 N/mm^2$. Solve using Castigliano's theorem. Shown in Figure 3 [16]

6. A simply supported beam of span L is crossed by a uniformly distributed load of length 'a' and of total weight W. If 'L' is greater than 'a', obtain form the first principles an expression for the maximum bending moment at any point distance 'b' from one support. [16]

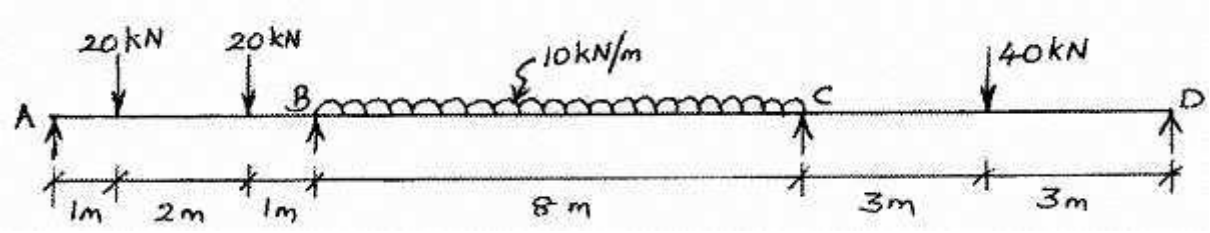

Figure 2:

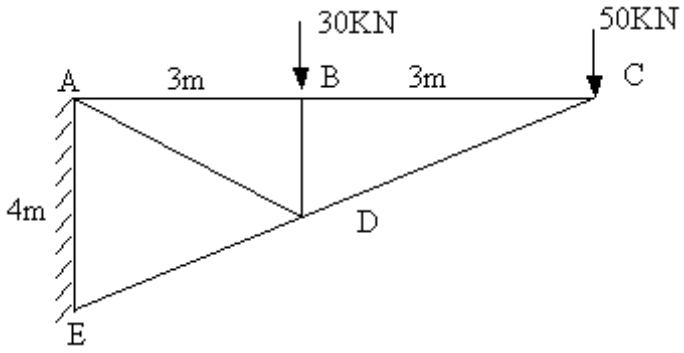

Figure 3:

7. A Pratt truss of 48m span has eight panels of 6m each. The height of the truss is 8m. Draw the influence line for the force in the bottom chord member and the diagonal of the third panel from the left. Hence calculate the maximum forces in these members for a uniformly distributed moving load of 80kN/m longer than the span. [16]

8. Analyse the frame shown in Figure 4. All the members have same cross sectional area of $20cm^2$. E in same for all the members. [16]

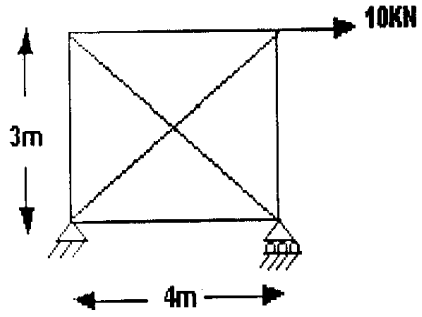

Figure 4:

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Code No: RR220104 **Set No. 3**

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1. Draw the bending moment and shear force diagram of a propped cantilever beam of span 6m due to a point load of 6 kN at the mid span. [16]

2. Find the fixed end moments for a fixed beam of span 6 m subjected to a concentrated clockwise moment of 10 kNm at 2.5 m from the left end. [16]

3. The pin jointed truss shown in Figure 1 is loaded with two point loads of 20kN and 10kN at the upper joints. Evaluate the forces in the members using the method of tension coefficients. [16]

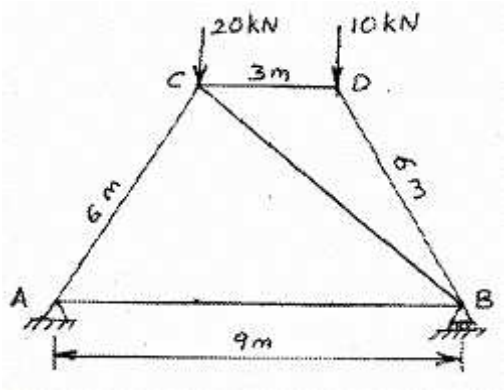

Figure 1:

4. A continuous beam ABC consists of spans AB and BC of lengths 4m and 6m respectively, the ends A and B being fixed. C is a free end. The span AB carries a uniformly distributed load of 24 kN/m while the span BC carries a point load of 108 kN at a distance of 2m from C. Find the support moments and support reactions. [16]

5. In the pin jointed frame shown in Figure 2, if joint B undergoes horizontal and vertical displacements of magnitude δ_u, δ_v respectively. Find the magnitude of the load that is applied at B. If $A_1, A_2 and L_1, L_2$ represent the area of c/s and lengths of the members AB and BC respectively, with E as modulus of elasticity then what shall be the force required if the joint B has no horizontal shift. [16]

6. Two equal loads of 80kN each, spaced 4m apart roll over a girder of 12m span. Calculate the maximum B.M anywhere in the girder. [16]

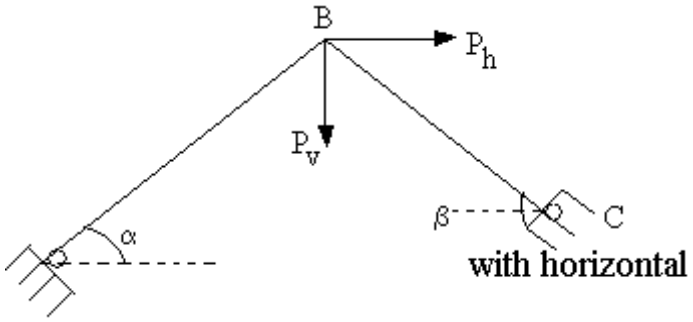

Figure 2:

7. A Pratt truss of 48m span has eight panels of 6m each. The height of the truss is 8m. Draw the influence line for the force in the bottom chord member and the diagonal of the third panel from the left. Hence calculate the maximum forces in these members for a uniformly distributed moving load of 80kN/m longer than the span. [16]

8. (a) Differentiate between static and Kinematic Indeterminacy.
   (b) Find the force in member BC of the frame loaded as shown in Figure 3.1all the members have the same cross sectional area. [6+10]

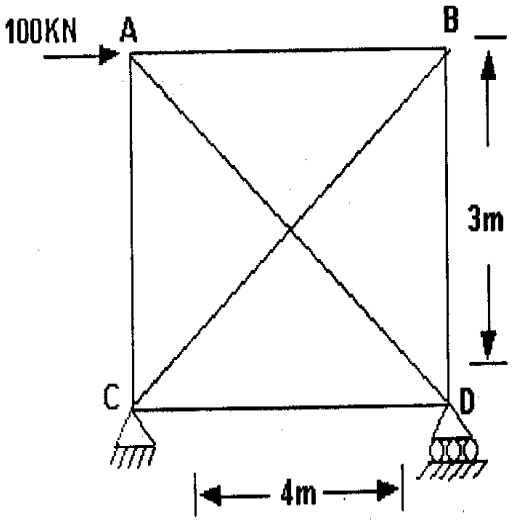

Figure 3:

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Code No: RR220104 **Set No. 4**

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November/December 2005
STRUCTURAL ANALYSIS-I
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
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1. Find the maximum bending moment and locate the point of inflection for a propped cantilever beam of span 5 m due to a uniformly varying load, whose intensity is 5 kN/m at the fixed support and 2 kN/m at the simple support. [16]

2. Find the fixed end moments for a fixed beam of span 6 m subjected to a concentrated clockwise moment of 10 kNm at 2.5 m from the left end. [16]

3. The pin jointed truss shown in Figure 1 is loaded with two point loads of 20kN and 10kN at the upper joints. Evaluate the forces in the members using the method of tension coefficients. [16]

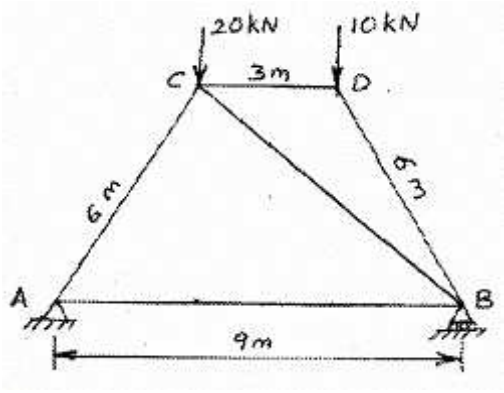

Figure 1:

4. A two span continuous beam of constant moment of inertia is loaded as shown in Figure 2. Find the support moments using Clapeyron's theorem of three moments. Also plot BM and SF diagrams for the beam. [16]

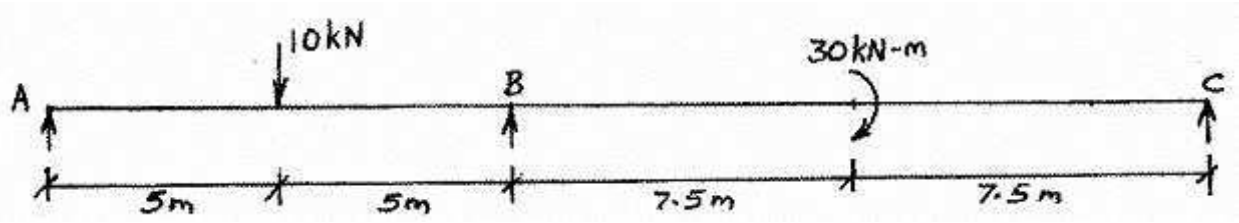

Figure 2:

5. Determine the slope and displacement at the free end for a cantilever , span Lm loaded with UDL of w/m run EI is constant. [16]

6. Two point loads of 6kN and 8kN spaced 6m apart cross a girder of span 16m, the 6kN load leading from left to right. Construct the maximum S.F and B.M diagrams, stating the absolute maximum values. [16]

7. A beam CABD is simply supported at A and B and has overhangs on both the supports. Overhang CA=2m, span AB=10m and overhang BD=2.5m. Draw the influence lines for B.M at A,B and at the centre of AB. [16]

8. (a) What are the Advantages and disadvantages of statically indeterminate trusses?
   (b) Explain how castigluauos theorem provides an elegant method of solution to indeterminate trusses by considering one example? [6+10]

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