Code No: R05410102 **R05** **Set No. 2**

IV B.Tech I Semester Examinations,November 2010
FINITE ELEMENT METHODS IN CIVIL ENGINEERING
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Describe the assembly of global stiffness matrix with an example for the banded and skyline solutions. [16]

2. Give a detailed method of finding the stresses in the frame shown in the figure 2 Take Cross section = 2cm × 1cm. [16]

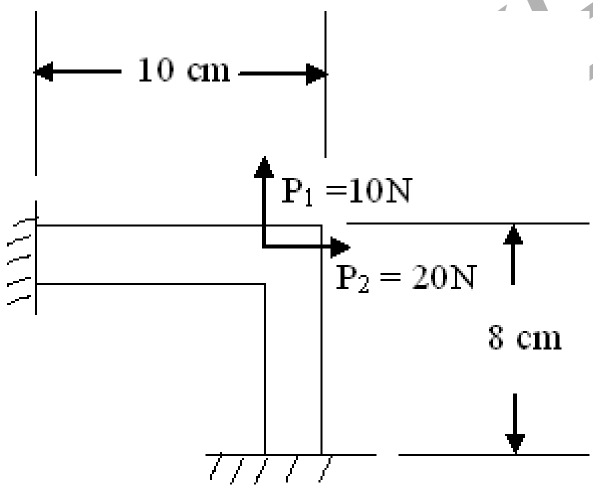

Figure 2

3. Derive the finite element equation using displacement formulation to solve two dimensional finite element problems. [16]

4. For a system of two springs shown in figure 4, Derive the system stiffness matrix and displacements at all node points. [16]

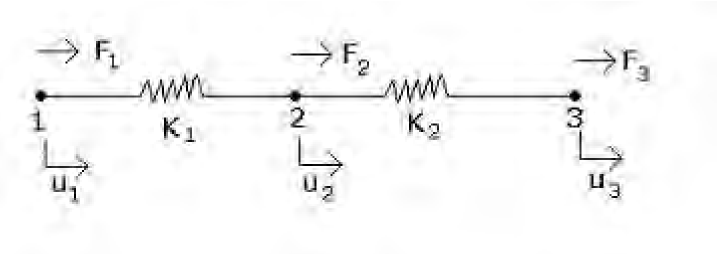

Figure 4

5. Evaluate the element stiffness matrix for the element shown in Figure 5. The coordinates are given in units of millimeters. Assume plane stress conditions. Let E=210GPa, v=0.25 and thickness=10mm. [16]

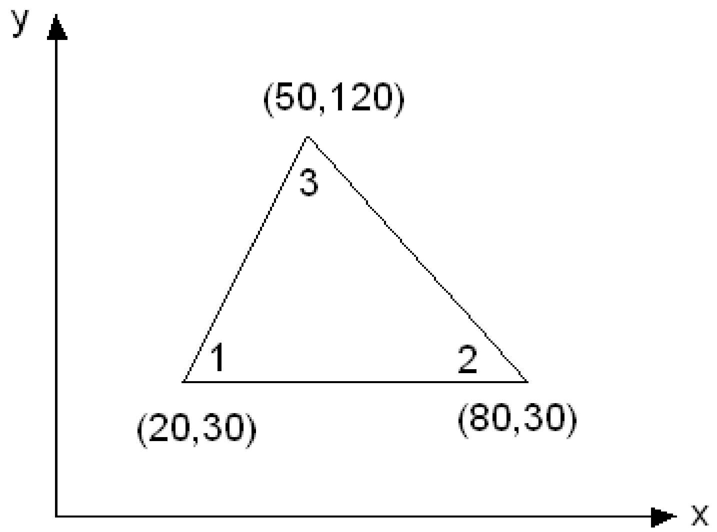

Figure 5

6. For the plane strain element shown in figure 6. the nodal displacements are given as
   $u_1 = 0.025mm \quad v_1 = 0.125mm \quad u_2 = 0.025mm$
   $v_2 = 0.0625mm \quad u_3 = 0.0 \qquad v_3 = 0.0$
   Determine the element stresses $\sigma_x, \sigma_y, \tau_{xy}, \sigma_1,$ *and* σ_2 and the principle angle θ_p. Use the values of E=210GPa, υ =0.25 and unit thickness for plane strain. All coordinates are in millimeters. [16]

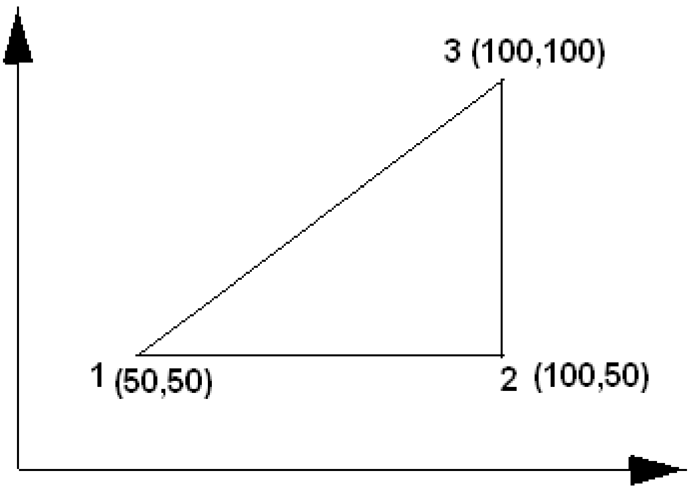

Figure 6

7. (a) Determine approximate location of center of mass of an irregular region using trapezoidal finite elements.
   (b) Define Domain. Explain clearly the formulae of integration by parts [8+8]

8. Derive the expression for elasticity matrix D (where $\sigma = D\varepsilon$) for plane stress situation in terms of modulus of elasticity (E) and poison"s ratio (μ). [16]

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Code No: R05410102 **R05** **Set No. 4**

IV B.Tech I Semester Examinations,November 2010
FINITE ELEMENT METHODS IN CIVIL ENGINEERING
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive the finite element equation using displacement formulation to solve two dimensional finite element problems. [16]

2. Evaluate the element stiffness matrix for the element shown in Figure 2. The coordinates are given in units of millimeters. Assume plane stress conditions. Let E=210GPa, v=0.25 and thickness=10mm. [16]

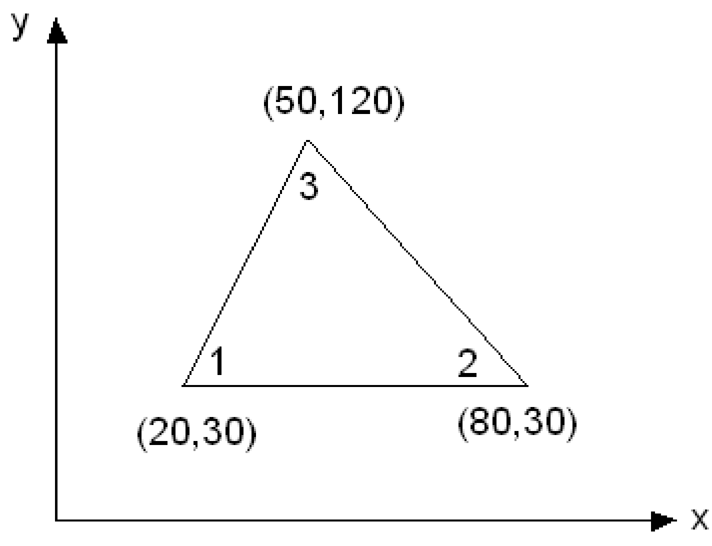

Figure 2

3. Give a detailed method of finding the stresses in the frame shown in the figure 3 Take Cross section = 2cm × 1cm. [16]

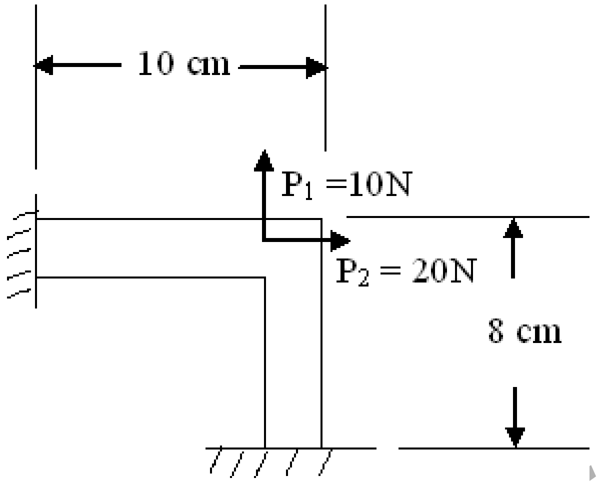

Figure 3

4. Derive the expression for elasticity matrix D (where σ =Dε) for plane stress situation in terms of modulus of elasticity (E) and poison"s ratio (μ). [16]

5. For a system of two springs shown in figure 5, Derive the system stiffness matrix and displacements at all node points. [16]

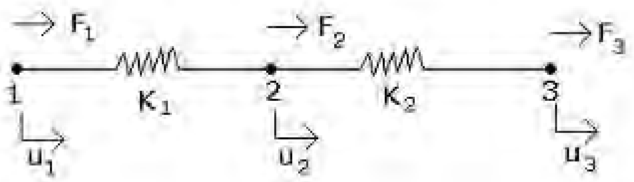

Figure 5

6. (a) Determine approximate location of center of mass of an irregular region using trapezoidal finite elements.
   (b) Define Domain. Explain clearly the formulae of integration by parts [8+8]

7. Describe the assembly of global stiffness matrix with an example for the banded and skyline solutions. [16]

8. For the plane strain element shown in figure 8. the nodal displacements are given as
   $u_1 = 0.025mm \quad v_1 = 0.125mm \quad u_2 = 0.025mm$
   $v_2 = 0.0625mm \quad u_3 = 0.0 \quad v_3 = 0.0$
   Determine the element stresses $\sigma_x, \sigma_y, \tau_{xy}, \sigma_1,$ and σ_2 and the principle angle θ_p. Use the values of E=210GPa, υ =0.25 and unit thickness for plane strain. All coordinates are in millimeters. [16]

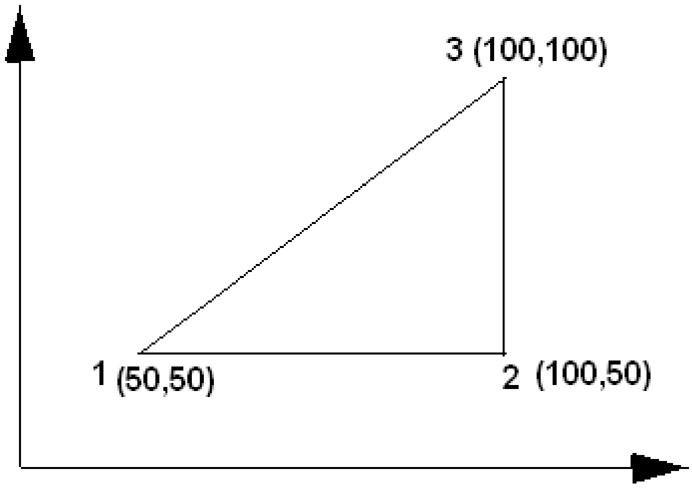

Figure 8

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R05410102 **R05** **Set No. 1**

IV B.Tech I Semester Examinations,November 2010
FINITE ELEMENT METHODS IN CIVIL ENGINEERING
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. Derive the finite element equation using displacement formulation to solve two dimensional finite element problems. [16]

2. Evaluate the element stiffness matrix for the element shown in Figure 2. The coordinates are given in units of millimeters. Assume plane stress conditions. Let E=210GPa, v=0.25 and thickness=10mm. [16]

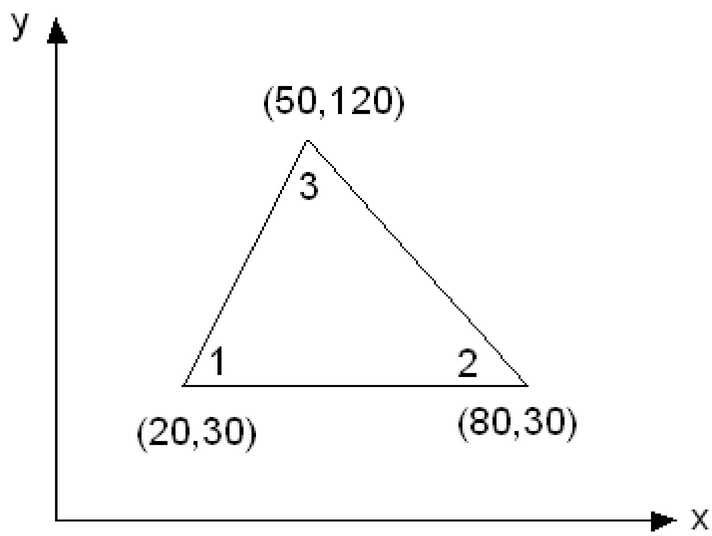

Figure 2

3. Describe the assembly of global stiffness matrix with an example for the banded and skyline solutions. [16]

4. For the plane strain element shown in figure 4. the nodal displacements are given as
$u_1 = 0.025mm \quad v_1 = 0.125mm \quad u_2 = 0.025mm$
$v_2 = 0.0625mm \quad u_3 = 0.0 \quad v_3 = 0.0$
Determine the element stresses $\sigma_x, \sigma_y, \tau_{xy}, \sigma_1,$ *and* σ_2 and the principle angle θ_p. Use the values of E=210GPa, υ =0.25 and unit thickness for plane strain. All coordinates are in millimeters. [16]

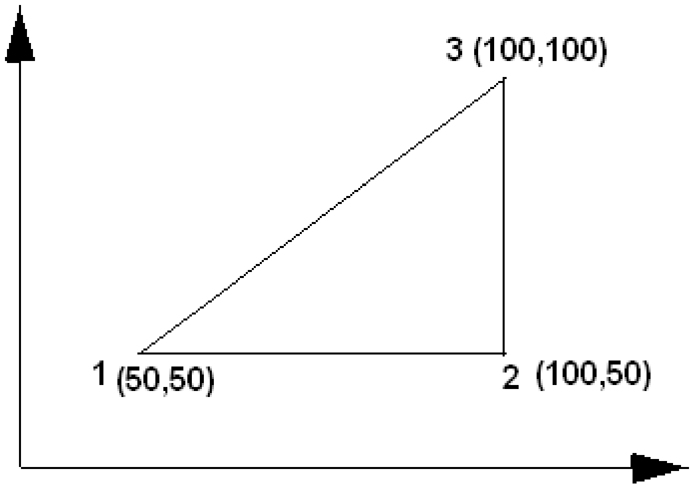

Figure 4

5. Give a detailed method of finding the stresses in the frame shown in the figure 5 Take Cross section = 2cm × 1cm. [16]

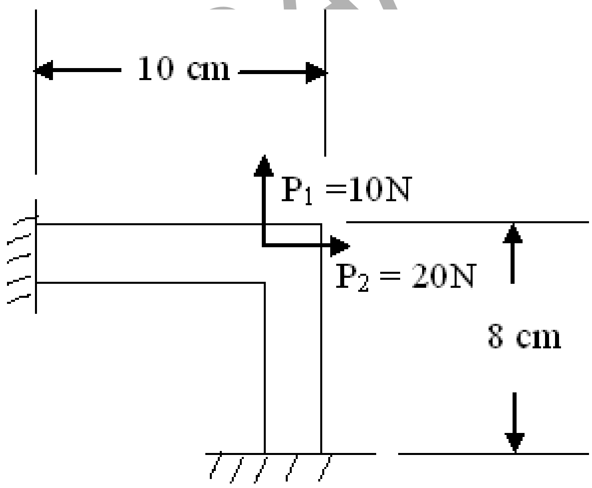

Figure 5

6. (a) Determine approximate location of center of mass of an irregular region using trapezoidal finite elements.
   (b) Define Domain. Explain clearly the formulae of integration by parts [8+8]

7. For a system of two springs shown in figure 7, Derive the system stiffness matrix and displacements at all node points. [16]

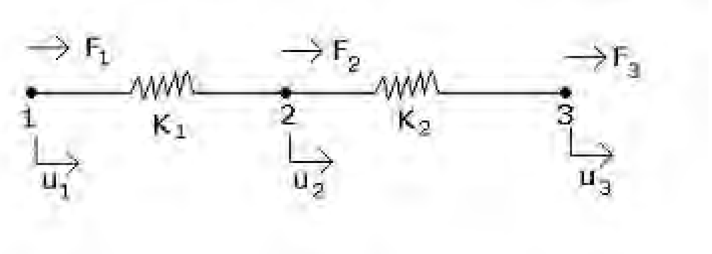

Figure 7

8. Derive the expression for elasticity matrix D (where σ =Dε) for plane stress situation in terms of modulus of elasticity (E) and poison"s ratio (μ). [16]

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Code No: R05410102 **R05** **Set No. 3**

IV B.Tech I Semester Examinations,November 2010
FINITE ELEMENT METHODS IN CIVIL ENGINEERING
Civil Engineering

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

Answer any FIVE Questions
All Questions carry equal marks
⋆ ⋆ ⋆ ⋆ ⋆

1. Derive the finite element equation using displacement formulation to solve two dimensional finite element problems. [16]

2. Describe the assembly of global stiffness matrix with an example for the banded and skyline solutions. [16]

3. (a) Determine approximate location of center of mass of an irregular region using trapezoidal finite elements.
   (b) Define Domain. Explain clearly the formulae of integration by parts. [8+8]

4. Derive the expression for elasticity matrix D (where σ =Dε) for plane stress situation in terms of modulus of elasticity (E) and poison"s ratio (μ). [16]

5. For a system of two springs shown in figure 5, Derive the system stiffness matrix and displacements at all node points. [16]

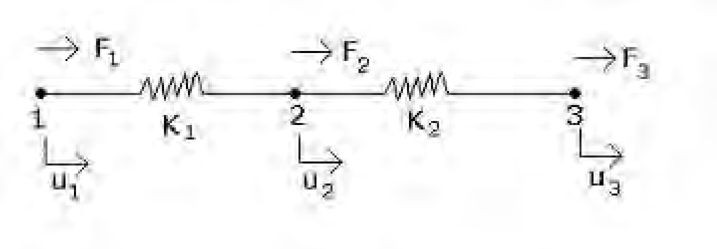

Figure 5

6. For the plane strain element shown in figure 6. the nodal displacements are given as
   $u_1 = 0.025mm \quad v_1 = 0.125mm \quad u_2 = 0.025mm$
   $v_2 = 0.0625mm \quad u_3 = 0.0 \quad v_3 = 0.0$
   Determine the element stresses $\sigma_x, \sigma_y, \tau_{xy}, \sigma_1,$ *and* σ_2 and the principle angle θ_p. Use the values of E=210GPa, υ =0.25 and unit thickness for plane strain. All coordinates are in millimeters. [16]

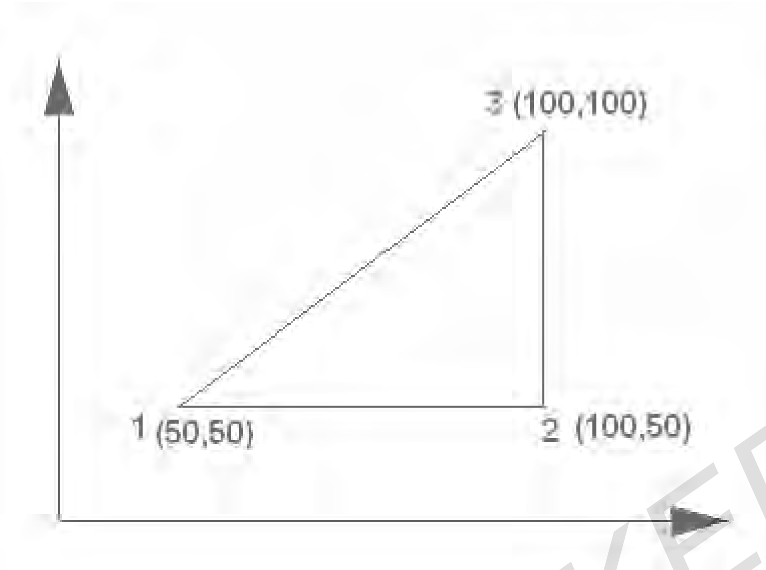

Figure 6

7. Give a detailed method of finding the stresses in the frame shown in the figure 7 Take Cross section = 2cm × 1cm. [16]

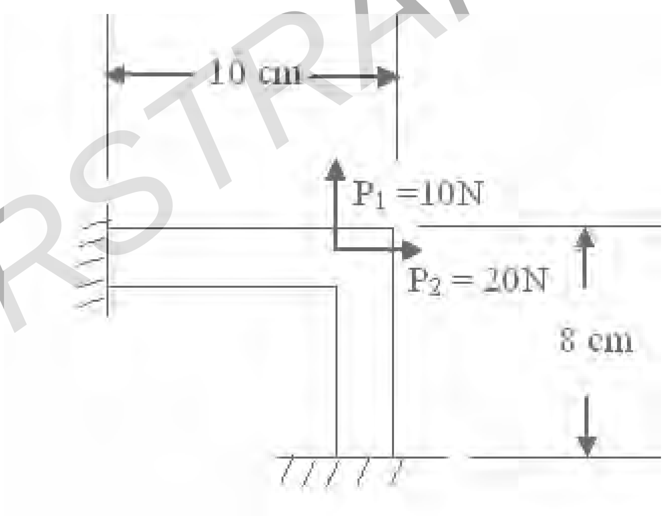

Figure 7

8. Evaluate the element stiffness matrix for the element shown in Figure 8. The coordinates are given in units of millimeters. Assume plane stress conditions. Let E=210GPa, v=0.25 and thickness=10mm. [16]

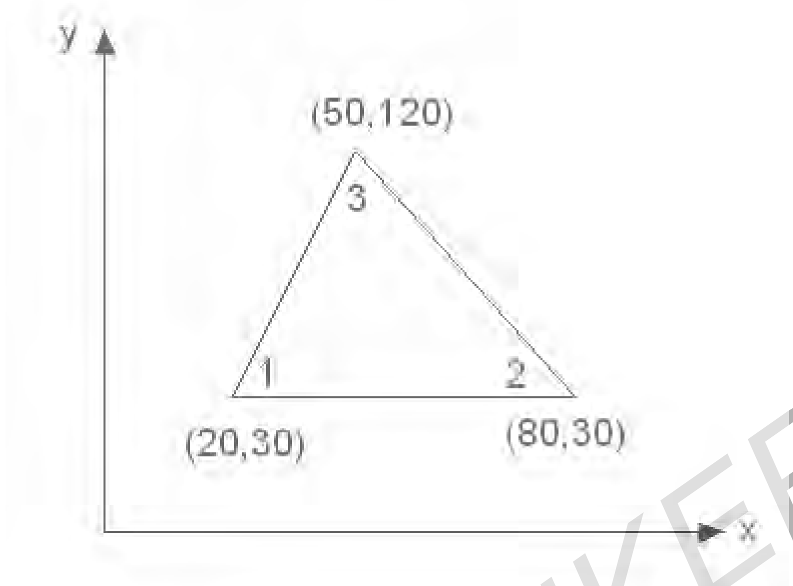

Figure 8

⋆ ⋆ ⋆ ⋆ ⋆