Code No: R05410309 **R05** **Set No. 2**

IV B.Tech I Semester Examinations,NOVEMBER 2010
FINITE ELEMENT METHOD
Common to Mechanical Engineering, Production Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Write down six 3D strain - displacement equations.
   (b) Explain the Principle of Minimum Potential Energy. [8+8]

2. (a) Explain about Natural Co-ordinates system.
   (b) The nodal coordinates and its functional value of a triangular linear element is given below. Calculate the value at (36, 9). [6+10]

	Co-ordinates	Value
Node 1	(31,16)	130
Node 2	(38,9)	94
Node 3	(31,13)	125

3. (a) How do you calculate the element stresses for 3-Dimensional body?
   (b) Derive the element stiffness term and force term for four noded tetrahedral elements. [8+8]

4. A beam of 4 m length is subjected to point loads at the distances of 2 m and 4 m from the fixed end of 10 kN and 20 kN respectively. Calculate the deflection at the center of the beam, if E = 2 x 10^{11} N/m^2 and A = 400 mm^2. {As shown in the Figure 5} [16]

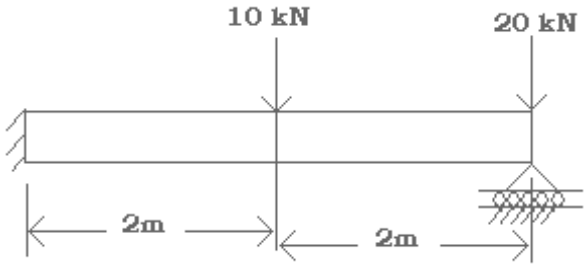

Figure 5

5. (a) From first principles, derive the general equation for elemental mass matrix?
   (b) Derive the elemental mass matrix for 2-D triangular element? [8+8]

6. Discuss the finite element methodology to solve the torsion problems from the first principles? [16]

7. Starting from the first principles derive the stiffness matrix for a 1- D bar element and extend it for the plane truss element? [16]

8. Derive stiffness equations for a bar element from the one dimensional second order equation by variated approach. [16]

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Code No: R05410309 **R05** **Set No. 4**

IV B.Tech I Semester Examinations,NOVEMBER 2010
FINITE ELEMENT METHOD
Common to Mechanical Engineering, Production Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive stiffness equations for a bar element from the one dimensional second order equation by variated approach. [16]
2. Starting from the first principles derive the stiffness matrix for a 1- D bar element and extend it for the plane truss element? [16]
3. Discuss the finite element methodology to solve the torsion problems from the first principles? [16]
4. A beam of 4 m length is subjected to point loads at the distances of 2 m and 4 m from the fixed end of 10 kN and 20 kN respectively. Calculate the deflection at the center of the beam, if E = 2 x 10^{11} N/m^2 and A = 400 mm^2. {As shown in the Figure 5} [16]

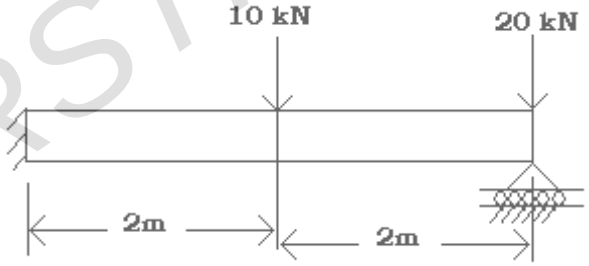

Figure 5

5. (a) From first principles, derive the general equation for elemental mass matrix?
   (b) Derive the elemental mass matrix for 2-D triangular element? [8+8]
6. (a) Write down six 3D strain - displacement equations.
   (b) Explain the Principle of Minimum Potential Energy. [8+8]
7. (a) How do you calculate the element stresses for 3-Dimensional body?
   (b) Derive the element stiffness term and force term for four noded tetrahedral elements. [8+8]
8. (a) Explain about Natural Co-ordinates system.

(b) The nodal coordinates and its functional value of a triangular linear element is given below. Calculate the value at (36, 9). [6+10]

	Co-ordinates	Value
Node 1	(31,16)	130
Node 2	(38,9)	94
Node 3	(31,13)	125

⋆ ⋆ ⋆ ⋆ ⋆

Code No: R05410309 **R05** **Set No. 1**

IV B.Tech I Semester Examinations,NOVEMBER 2010
FINITE ELEMENT METHOD
Common to Mechanical Engineering, Production Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A beam of 4 m length is subjected to point loads at the distances of 2 m and 4 m from the fixed end of 10 kN and 20 kN respectively. Calculate the deflection at the center of the beam, if E = 2 x 10^{11} N/m^2 and A = 400 mm^2. {As shown in the Figure 5} [16]

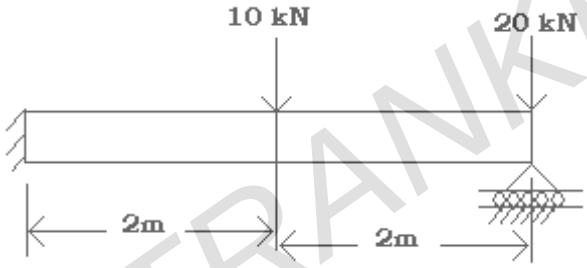

Figure 5

2. (a) Write down six 3D strain - displacement equations.
   (b) Explain the Principle of Minimum Potential Energy. [8+8]

3. (a) Explain about Natural Co-ordinates system.
   (b) The nodal coordinates and its functional value of a triangular linear element is given below. Calculate the value at (36, 9). [6+10]

	Co-ordinates	Value
Node 1	(31,16)	130
Node 2	(38,9)	94
Node 3	(31,13)	125

4. (a) How do you calculate the element stresses for 3-Dimensional body?
   (b) Derive the element stiffness term and force term for four noded tetrahedral elements. [8+8]

5. Derive stiffness equations for a bar element from the one dimensional second order equation by variated approach. [16]

6. Discuss the finite element methodology to solve the torsion problems from the first principles? [16]

7. (a) From first principles, derive the general equation for elemental mass matrix?

(b) Derive the elemental mass matrix for 2-D triangular element? [8+8]

8. Starting from the first principles derive the stiffness matrix for a 1- D bar element and extend it for the plane truss element? [16]

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Code No: R05410309 **R05** **Set No. 3**

IV B.Tech I Semester Examinations,NOVEMBER 2010
FINITE ELEMENT METHOD
Common to Mechanical Engineering, Production Engineering, Automobile Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive stiffness equations for a bar element from the one dimensional second order equation by variated approach. [16]
2. Starting from the first principles derive the stiffness matrix for a 1- D bar element and extend it for the plane truss element? [16]
3. Discuss the finite element methodology to solve the torsion problems from the first principles? [16]
4. (a) Explain about Natural Co-ordinates system.
   (b) The nodal coordinates and its functional value of a triangular linear element is given below. Calculate the value at (36, 9). [6+10]

	Co-ordinates	Value
Node 1	(31,16)	130
Node 2	(38,9)	94
Node 3	(31,13)	125

5. A beam of 4 m length is subjected to point loads at the distances of 2 m and 4 m from the fixed end of 10 kN and 20 kN respectively. Calculate the deflection at the center of the beam, if E = 2 x 10^{11} N/m^2 and A = 400 mm^2. {As shown in the Figure 5} [16]

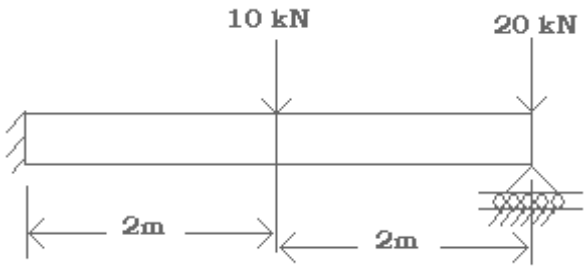

Figure 5

6. (a) How do you calculate the element stresses for 3-Dimensional body?
   (b) Derive the element stiffness term and force term for four noded tetrahedral elements. [8+8]
7. (a) Write down six 3D strain - displacement equations.
   (b) Explain the Principle of Minimum Potential Energy. [8+8]

8. (a) From first principles, derive the general equation for elemental mass matrix?
   (b) Derive the elemental mass matrix for 2-D triangular element? [8+8]

⋆ ⋆ ⋆ ⋆ ⋆