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

IV B.Tech I Semester Examinations,MAY 2011
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

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1. Consider the axial vibrations of a steel bar shown in the figure 1:
   (a) Develop global stiffness and mass matrices,
   (b) Determine the natural frequencies? [8+8]

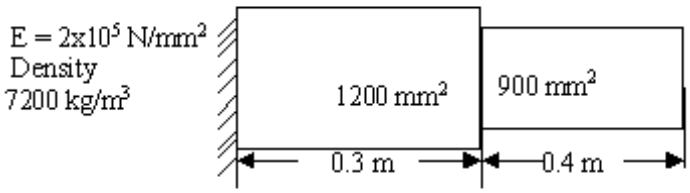

Figure 1

2. An axisymmetric ring element is shown in figure 2. Derive the matrices, [B] and [D]. Take E = 2×10^5 N/mm^{2}and $\mu = 0.33$. [16]

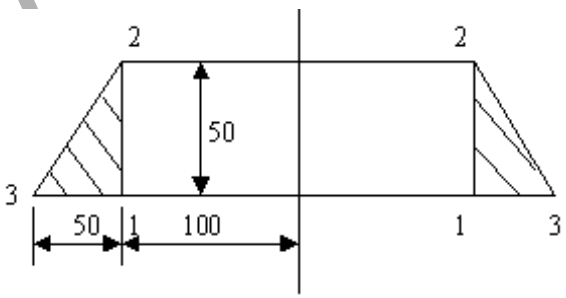

Figure 2

3. Derive the conductivity matrix and vector for the 2-D element when one of the faces is exposed to a heat transfer coefficient of h at T∞ and with internal heat generation of q W/m^3. [16]

4. An elastic bar is having a uniform cross sectional of area 'A' mm^2 and length 'L' mm. It is fixed at one end and other end is allowed to move along the axis of the elastic bar. A force 'F' KN is acting at the free end and the Youngs Modulus is 'E' N/mm^2. Calculate the displacement at the free end. [16]

5. (a) Explain the convergence criteria in finite element analysis.
   (b) Write about pre-processor, processor, and post-processor in any FEM software. [8+8]

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6. A simply supported beam of l m length carries a single point load P at the center of the span. Describize the span into two elements, find the value of central deflection using FEM? [16]

7. Consider the truss element with the coordinates i(10,10) & q(50,40) If the displacement vector is q=[15 10 21 43]^T mm, then determine

   (a) The trace vector F

   (b) Stress in each element

   (c) Stiffness matrix if E= 70 GPA and A= 200 mm^2. [6+4+6]

8. Using the general approach of displacement function, derive the force-displacement relationship and element stiffness matrix. for a truss bar element. [16]

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

IV B.Tech I Semester Examinations,MAY 2011
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

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1. (a) Explain the convergence criteria in finite element analysis.
   (b) Write about pre-processor, processor, and post-processor in any FEM software. [8+8]

2. A simply supported beam of l m length carries a single point load P at the center of the span. Descritize the span into two elements, find the value of central deflection using FEM? [16]

3. Derive the conductivity matrix and vector for the 2-D element when one of the faces is exposed to a heat transfer coefficient of h at T$\propto$ and with internal heat generation of q W/m^3. [16]

4. Consider the axial vibrations of a steel bar shown in the figure 3:
   (a) Develop global stiffness and mass matrices,
   (b) Determine the natural frequencies? [8+8]

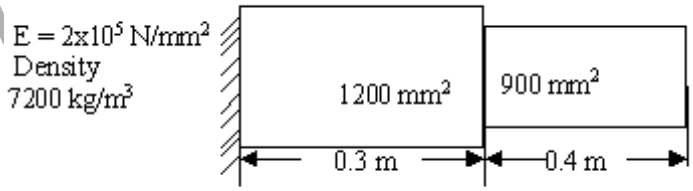

Figure 3

5. Using the general approach of displacement function, derive the force-displacement relationship and element stiffness matrix. for a truss bar element. [16]

6. An elastic bar is having a uniform cross sectional of area 'A' mm^2 and length 'L' mm. It is fixed at one end and other end is allowed to move along the axis of the elastic bar. A force 'F' KN is acting at the free end and the Youngs Modulus is 'E' N/mm^2. Calculate the displacement at the free end. [16]

7. Consider the truss element with the coordinates i(10,10) & q(50,40) If the displacement vector is q=[15 10 21 43]^T mm, then determine
   (a) The trace vector F

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(b) Stress in each element

(c) Stiffness matrix if E= 70 GPA and A= 200 mm^2. [6+4+6]

8. An axisymmetric ring element is shown in figure 4. Derive the matrices, [B] and [D]. Take E = 2×10^5 N/mm^{2}and $\mu = 0.33$. [16]

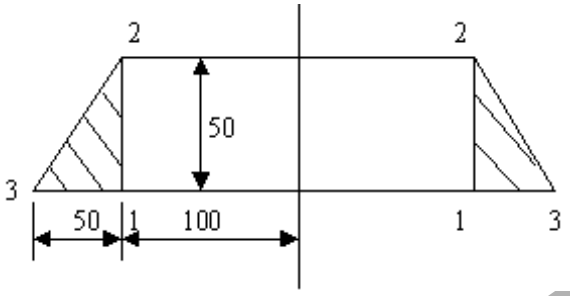

Figure 4

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

IV B.Tech I Semester Examinations,MAY 2011
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

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1. Consider the truss element with the coordinates i(10,10) & q(50,40) If the displacement vector is q=$[15\ 10\ 21\ 43]^T$ mm, then determine
   (a) The trace vector F
   (b) Stress in each element
   (c) Stiffness matrix if E= 70 GPA and A= 200 mm^2. [6+4+6]
2. An elastic bar is having a uniform cross sectional of area 'A' mm^2 and length 'L' mm. It is fixed at one end and other end is allowed to move along the axis of the elastic bar. A force 'F' KN is acting at the free end and the Youngs Modulus is 'E' N/mm^2. Calculate the displacement at the free end. [16]
3. (a) Explain the convergence criteria in finite element analysis.
   (b) Write about pre-processor, processor, and post-processor in any FEM software. [8+8]
4. A simply supported beam of l m length carries a single point load P at the center of the span. Descritize the span into two elements, find the value of central deflection using FEM? [16]
5. Using the general approach of displacement function, derive the force-displacement relationship and element stiffness matrix. for a truss bar element. [16]
6. Derive the conductivity matrix and vector for the 2-D element when one of the faces is exposed to a heat transfer coefficient of h at T$\propto$ and with internal heat generation of q W/m^3. [16]
7. Consider the axial vibrations of a steel bar shown in the figure 5:
   (a) Develop global stiffness and mass matrices,
   (b) Determine the natural frequencies? [8+8]

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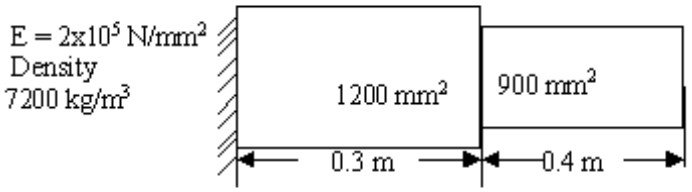

Figure 5

8. An axisymmetric ring element is shown in figure 6. Derive the matrices, [B] and [D]. Take E = 2×10^5 N/mm^{2}and $\mu = 0.33$. [16]

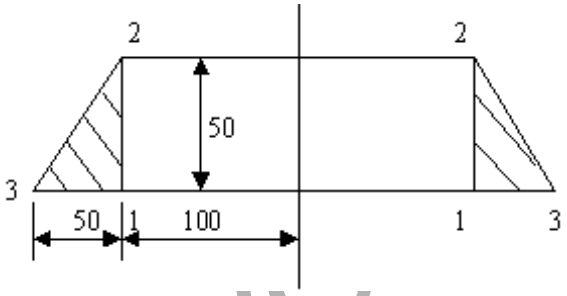

Figure 6

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

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FINITE ELEMENT METHOD
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Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. An axisymmetric ring element is shown in figure 7. Derive the matrices, [B] and [D]. Take E = 2×10^5 N/mm^{2}and $\mu = 0.33$. [16]

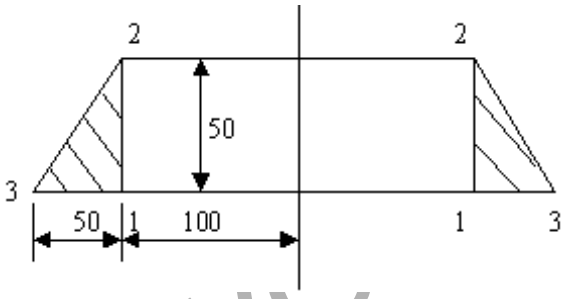

Figure 7

2. Using the general approach of displacement function, derive the force-displacement relationship and element stiffness matrix. for a truss bar element. [16]

3. A simply supported beam of l m length carries a single point load P at the center of the span. Descritize the span into two elements, find the value of central deflection using FEM? [16]

4. Derive the conductivity matrix and vector for the 2-D element when one of the faces is exposed to a heat transfer coefficient of h at T$\propto$ and with internal heat generation of q W/m^3. [16]

5. Consider the axial vibrations of a steel bar shown in the figure 8:
   (a) Develop global stiffness and mass matrices,
   (b) Determine the natural frequencies? [8+8]

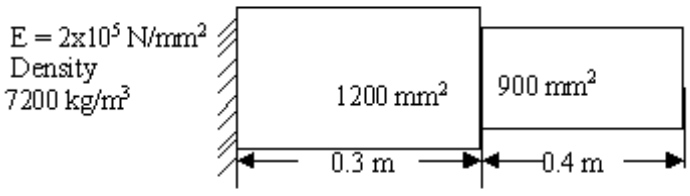

Figure 8

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6. An elastic bar is having a uniform cross sectional of area 'A' mm^2 and length 'L' mm. It is fixed at one end and other end is allowed to move along the axis of the elastic bar. A force 'F' KN is acting at the free end and the Youngs Modulus is 'E' N/mm^2. Calculate the displacement at the free end. [16]

7. Consider the truss element with the coordinates i(10,10) & q(50,40) If the displacement vector is q=$[15\ 10\ 21\ 43]^T$ mm, then determine

   (a) The trace vector F

   (b) Stress in each element

   (c) Stiffness matrix if E= 70 GPA and A= 200 mm^2. [6+4+6]

8. (a) Explain the convergence criteria in finite element analysis.

   (b) Write about pre-processor, processor, and post-processor in any FEM software. [8+8]

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