

**IV B.Tech I Semester Supplementary Examinations, November 2005**  
**FINITE ELEMENT METHODS**

**( Common to Mechanical Engineering and Production Engineering)**

Time: 3 hours

Max Marks: 80

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

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1. Discuss the following

- (a) Derivation of element stiffness matrix.
- (b) Assembly of Global stiffness Matrix

[8+8]

2. Explain the mathematical interpretation of finite element method for one dimensional field problems. [16]

3. For the truss structure shown in figure1 is subjected to a horizontal load of 4 kN in positive x-direction at node 2. Calculate

- (a) stiffness matrix and
- (b) stresses.

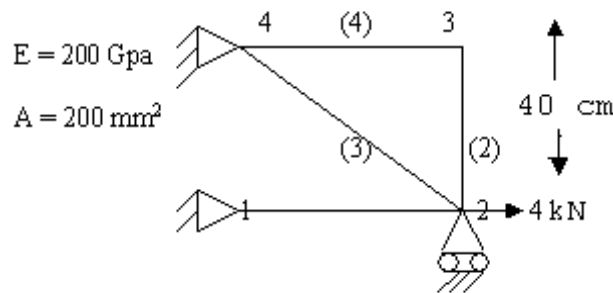


Figure 1:

[10+6]

4. Define and derive the Hermite shape functions for a two noded beam element?

[16]

5. (a) Show that the value of the shape function  $N_1$  of node i and node k of a simplex triangular element is zero and at node 1 is one.

- (b) The (x, y) coordinates of the nodes i, j and k of a triangular element are (1, 1), (4, 2) and (3, 5) respectively. The shape functions of a point P located

inside the element are given by  $N_1 = 0.15$  and  $N_2 = 0.25$ . Determine the x and y coordinates of the point P.

[6+10]

6. Derive the element stiffness matrix for torsion element in terms of modulus of rigidity, polar moment of inertia and the length of the shaft? [16]
7. Explain the following with examples.
- (a) Lumped parameter model.
  - (b) Consistant mass matrix model.

[8+8]

8. Establish Jacobian matrix for a Tetrahedron element. [16]

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