Code No: C3ME06

III B.Tech(CCC) Regular Examinations, January 2010
FINITE ELEMENT METHODS
Mechanical Engineering

Time: 3 hours **Max Marks: 100**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Derive the elemental jumped and consistant mass matrices for 1-D bar element and 1-D plane truss element? [20]

2. (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. [8+12]

3. If a displacement field is described as follows,
   $$u = (-x^2 + 2y^2 + 6xy)10^{-4} \text{ and } v = (3x + 6y - y^2)10^{-4}$$
   Determine the strain components $\in_{xx}$, $\in_{yy}$, and $\in_{xy}$ at the point x=1 ; y = 0. [20]

4. Find the temperature distribution in the square plate as shown in figure 4. Assume K = 30 W/m K, T$\propto$ = 50^0C and q = 100 W/m^3. [20]

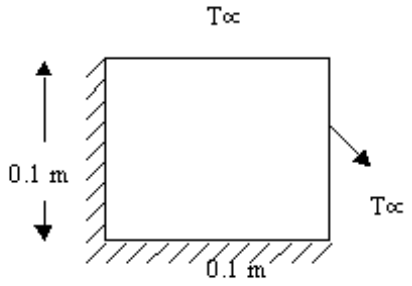


Figure 4

5. A load of magnitude 10kN is applied at point B of a rigid bar of AC is supported by the cable as shown in figure 5. The cross sectional area of the cable is 100 mm^2 and Young's modulus of 2×10^{11} N/m^2.Determine

   (a) The finite element equilibrium equations of the system by modeling and

   (b) Nodal displacements of the system. [10+10]

Code No: C3ME06

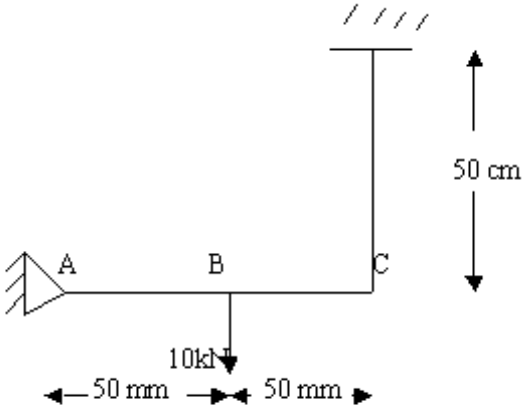


Figure 5

6. What are the advantages of display IV in 16 NISA-II version 11 as compared to preprocessor in ANSYS V6.1 ? [20]

7. With a suitable example explain the formulation of finite element equations by direct approach. Assume suitable data for the example. Use I-D analysis [20]

8. Find the deflection at the point of the load of the steel shaft as shown in figure 8 : take E = 200 Gpa. [20]

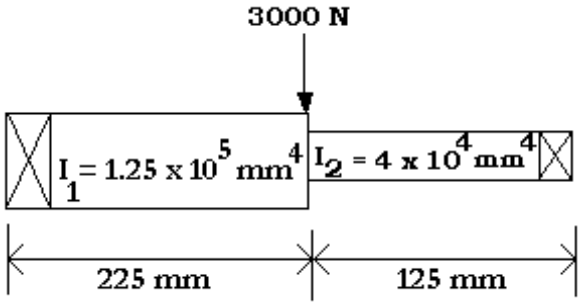


Figure 8

⋆ ⋆ ⋆ ⋆ ⋆