

Code: R7410303

R7

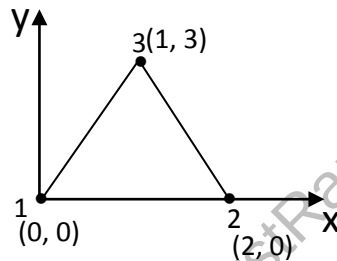
IV B.Tech I Semester (R07) Supplementary Examinations, May 2012
FINITE ELEMENT METHODS
(Mechanical Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

1. (a) Explain the advantages and disadvantages of FEM.
(b) Write the stress-strain relations for linear, elastic, homogeneous
(i) Isotropic (ii) Orthotropic (iii) Anisotropic elements
2. Derive the shape function and stiffness matrix for 1-D 3 nodal quadratic element.
3. Derive the element stiffness matrix and nodal load matrices for 2-nodal beam element.
4. Determine the element stiffness matrix and the thermal load vector for the plane stress element shown in figure. The element experiences a 20°C increase in temperature. Take $E = 15 \times 10^6 \text{ N/cm}^2$, $z = 0.25$, $t = 0.5 \text{ cm}$, $\alpha = 6 \times 10^{-6}/^{\circ}\text{C}$



5. Explain the finite element modeling of Anti-symmetric solids subjected to Anti-symmetric loading with triangular elements.
6. A four node quadrilateral element is shown in figure. The nodal displacement vector is given as:
 $\bar{U} = [0.0, 0.0, 0.15, 0.10, 0.10, 0.125, 0.20, 0.0]^T_{\text{cm}}$ find the following
(i) The x and y coordinates of a point P whose location in the element is given by $\eta = 0.5$ and $\xi = 0.5$
(ii) The u, v displacements of the point P.
7. Discuss the one dimensional formulation of fin in detail in steady state heat transfer analysis.
8. Write short notes on:
(a) Formulation of finite element model in dynamic analysis.
(b) Eigen values and Eigen vectors for a stepped beam.
