R07

Code: R7410303

B.Tech IV Year I Semester (R07) Supplementary Examinations December 2015

FINITE ELEMENT METHODS

(Mechanical Engineering)

(For 2008 regular admitted batch only)

Time: 3 hours Max. Marks: 80

Answer any FIVE questions

All questions carry equal marks

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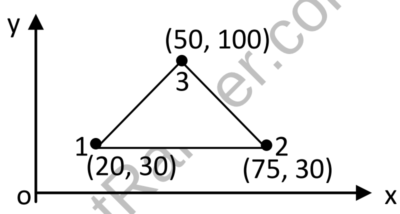
1 (a) How difficult is it to write a FEM program? Explain.

(b) Explain the stress-strain relations.

2 The following differential equation is available for a physical phenomenon, $d^2y/dx^2 + 50 = 0, 0 < x < 10$ the trial function is, $y = ax(10 - x)$. The boundary conditions are y(0) = 0 and y(10) = 0. Find the value of the parameter 'a' by (i) Point collocation method. (ii) Sub-domain collocation method. (iii) Least squares method. (iv) Galerkin's method.

3 Derive the stiffness matrix for a beam element. Assemble the stiffness matrix for a plane beam element oriented at angle θ to the x-axis. Explain its use in FEA.

4 The plane stress element shown below. Evaluate the stiffness matrix. Assume $E = 210 \times 10^3\ N/mm^2$, Poisson's ratio M = 0.25 and element thickness t = 10 mm. The coordinates are given in millimeters.

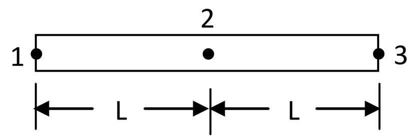


5 Derive an expression for the strain-displacement matrix for an axisymmetric triangular element.

6 Derive the stiffness matrix for a linear isoparametric element.

7 Derive the basic differential equation for one dimensional problem of heat conduction without convection.

8 Determine the consistent-mass matrix for the one-dimensional bar discretized into two elements as shown in figure. Let the bar have modulus of elasticity E, mass density r and cross-sectional area A.



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