R17

Code No: 5401BZ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M. Tech II Semester Examinations, June/July - 2018

FINITE ELEMENT METHOD

(Common to AMS, TE)

Time: 3hrs Max.Marks:75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) List the various method of solving boundary value problems. [5]

b) Write down the expression of shape function 'N' and displacement 'U' for 1-D bar element. [5]

c) Explain geometric Isotropy. [5]

d) Explain the assumptions of plate theory. [5]

e) Explain the types of structural non linearities. [5]

PART - B

5 × 10 Marks = 50

2. Solve the differential equation for a physical problem expressed as $d^2y/dx^2 + 100 = 0$, $0 \le x \le 10$. with boundary conditions as $y(0)=0$ and $y(10)=0$ using a) Point collocation method b) Sub domain collocation method c) Least square method and d) Galerkin method. [10]

OR

3. A physical phenomenon is governed by the differential equation the boundary conditions are given by assuming a trial solution $w(x)=a_0+a_1x+a_2x^2+a_3x^3$, determine using Galerkin method, the variation of 'w', with respect to x. [10]

4. Determine the slope and deflection of a cantilever beam subjected to a uniformly distributed load 'q' over the entire span and a point load 'P' acting on its free end. [10]

OR

5. Derive an expression for shape function and assemble the stiffness matrix for bending in beam elements. [10]

6. The X,Y coordinates of nodes i, j and k of a triangular element are given by (0,0) (3,0) and (1.5,4) mm respectively. Evaluate the shape functions N1, N2 and N3 at an interior point P (2, 2.5) mm of the element. Evaluate the strain displacement relation matrix B for the above same triangular element and explain how stiffness matrix is obtained assuming scalar variable problem. [10]

OR

7.a) Derive the shape function for all the corner nodes of a nine noded quadrilateral element.

b) Explain the development of the equilibrium equation for a finite element. [5+5]

8. Explain the analysis of a thermo elastic problem of a simply supported rectangular thin plate with a circular hole and subjected to heat flow method of point matching. [10]

OR

9. Explain the finite element analysis of a simplest possible triangular bending element. [10]

10. Explain the analysis of geometrically nonlinear behavior with an example. [10]

OR

11. Explain the analysis of large displacement and small strain behavior with an example. [10]

---ooOoo---