Roll No: | | | | | | | | |

B.E (Full Time) DEGREE EXAMINATIONS, APRIL - MAY 2012

Manufacturing Engineering

Sixth Semester

MN 502 FINITE ELEMENT ANALYSIS OF MANUFACTURING PROCESSES

(Regulations 2005)

Time: Three hours Max. Marks: 100

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Answer ALL questions:

PART – A (10 x 2 = 20 marks)

1. What are the drawbacks of weighted residual methods?
2. What is Boundary value problem?
3. List the parameters which govern the selection of nodes.
4. How elements are classified?
5. What are lagrangian interpolation functions?
6. What is meant isoparametric?
7. What is advantage of Jacobian transformation?
8. Define hybrid refinement.
9. What is called as element regeneration?
10. What are the common softwares of finite element methods?

PART – B (16 x 5 = 80 marks)

11. a. Explain the following in detail: 16

    i) Preprocessing

    ii) Essential and Nonessential boundary conditions

    iii) Mesh Generation

    iv) Errors of FEM.

12. a. Solve $x^3 + 2x^2 + x + 10 = 0$ suing any one of the residual method. The conditions are $u(0) = 0$ and $u(4) = -1/2$. 16

Or

b. A conical steel structure, whose base is fixed at one end, and subjected to a compressive load of 250 kN at the tip. The base area of the structure is 40 cm^2 and the length is 60 cm. The elastic modulus and density are E = 220 GN/m^2 and v = $8x10^4$ N/m^3 respectively. Find out the deflection at 20cm, 40cm and 60 cm from the ceiling. Solve by Ritz method. 16

13. a The interior wall of a furnace is maintained at a temperature of 1100 K. The wall is 60 cm thick, 1m wide, 1.5 m broad of material whose thermal conductivity is 0.4 W/mK. The temperature of the outside surface of the wall is 475 K. Determine the heat at the intermediates. 16

Or

b. A copper bar is 900 mm long and circular in section. It consists of 200 mm long bar of 40 mm diameter, 500 mm long bar of 15 mm diameter and 200 mm long bar of 30 mm diameter. If the bar is subjected to a tensile load of 60 kN, find the extension of the bar and the stresses developed at the each cross section. 16

14. a. A triangular plate with nodes are located at the coordinate points and a temperature distribution has been computed at each node as T_a = 898 K, T_b = 578 K and T_c = 500 K. The coordinates for the plate are a(0,0), b(4,0), and c(2,5) Determine the temperature at x = 2 and y= 2.5. 16

Or

b. Derive the stiffness matrix for the one dimensional linear element using Natural Coordinate system. 16

15. a. How would you model the metal casting problem using finite element method? Discuss about the choice of the element. How would you account for the behavior of his problem? 16

Or

b. i) Explain the significance of transient analysis. 8

ii) Describe in detail about time stepping procedure. 8