Reg. No. : | | | | | | | | | | |

Question Paper Code: 12013

M.E. DEGREE EXAMINATION, DECEMBER 2013.

First Semester

CAD / CAM

01PCD102 - FINITE ELEMENT ANALYSIS IN MANUFACTURING ENGINEERING

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Write basic steps in Rayleigh-Ritz method.
2. State the principle of minimum potential energy.
3. Name three methods of boundary condition in heat transfer.
4. State the properties of stiffness matrix.
5. What do you mean by higher order elements?
6. Distinguish between sub-parametric and super parametric elements.
7. How do you represent friction between work piece and tool in FEA model?
8. Distinguish between Lagrangian and Euler techniques used in metal cutting.
9. Name the methods of mesh generation in ANSYS.
10. List any three common software errors in mesh generation.

PART - B (5 x 14 = 70 Marks)

11. (a) Solve the following boundary condition value problem using Galerkin FEM.
$d^2y/dx^2 + 5dy/dx + 7y = 0$
The boundary conditions are at $x = 0, y = 0$ and at $x = 1, dy/dx = 0$ (14)

Or

(b) Find the deflection at the center of a simply supported beam subjected to UDL throughout its length by using weighted residual technique for the following function, $y = A \sin(\pi x / L)$ (14)

12. (a) Derive load vector for a vertical hanging bar element subjected to both self weight and point load. (14)

Or

(b) Calculate stiffness matrix for a bar element as shown in Fig.1.It has three elements e_1, e_2 and e_3. Area and Young's modules are $A_1 = 2400\ mm^2$, $A_2 = 1200\ mm^2$, $A_3 = 600\ mm^2$ and $E_1 = 83$ GPa, $E_2 = 70$ GPa, $E_3 = 200$ GPa.

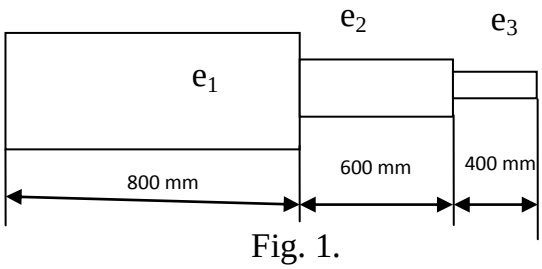

Fig. 1. (14)

13. (a) Determine a Jacobian matrix and transformation equation for the element shown in fig .2.

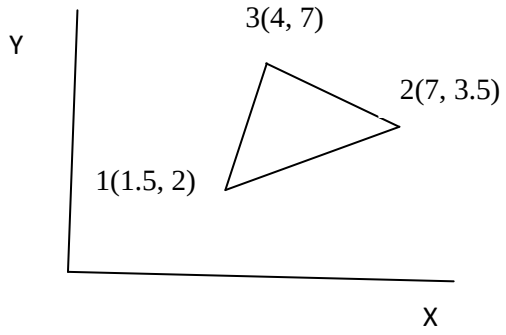

Fig .2. (14)

Or

(b) Derive the shape function expression for the 4 noded quadrilateral elements in terms of natural co-ordinates. (14)

14. (a) Briefly explain FE method of chip separation process using Arbitrary Lagrangian Eulerian formation. (14)

Or

(b) Explain the procedure of Finite element modeling of solidification phenomena. (14)

15. (a) What are the features available to define boundary condition in software? Explain any one in brief. (14)

Or

(b) Explain the method of plotting shear force and bending moment diagram of a cantilever beam in post processing session. (14)

PART - C (1 x 10 = 10 Marks)

16. (a) A furnace wall is made up of two layers, thermal conductivity and thickness of the inside layer is 8.5 W/mK, 250mm and outer layer is 0.08 W/mK, 50 mm respectively. Temperature of the inner side is 600^0C and outer side of the wall is exposed to atmospheric air at 30^0C. Determine the nodal temperature. (10)

Or

(b) Evaluate the Eigen value- Eigen vector by any one method and discuss the properties of Eigen vectors. (10)