Q.P. Code: **16ME8805** **R16**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
M.Tech I Year I Semester (R16) Regular Examinations January 2017
FINITE ELEMENT ANALYSIS IN THERMAL ENGINEERING
(Thermal Engineering)
(For Students admitted in 2016 only)

Time: **3 hours** Max. Marks: **60**

(Answer all Five Units **5 X 12 =60** Marks)

UNIT-I

Q.1 a. Explain basic steps involved in finite element analysis. 6M
b. Derive the strain displacement relationship for 2D situation. 6M

OR

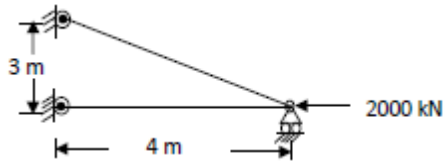
Q.2 a. Compare finite element method with finite difference method. 4M
b. Explain the Galerkin's residual method and its use to derive the one dimensional bar element equations. 8M

UNIT-II

Q.3 a. Write a note on quadratic shape functions. 5M
b. Derive the stiffness matrix for plane stress element. 7M

OR

Q.4 a. Determine the nodal displacement, element stresses and support reactions
for the two-bar truss shown in figure. Take E = 210 GPa and A = 600 mm^2
for each element.

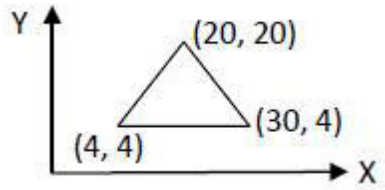


10M

b. Write a note on the polynomials involved in linear, quadratic & cubic 1D element. 2M

UNIT-III

Q.5 a. Determine the element stresses for the triangular element shown in figure. The nodal displacements are given as u_1 = 0.005 mm, u_2 = 0.002 mm, u_3 =0.0 mm, u_4 = 0.0 mm, u_5 = 0.004 mm, and u_6 = 0.0 mm Take E = 200 GPa & v = 0.3. Use unit thickness for plane strain. 10M



b. Discuss the importance of isoparametric concept used in FEM. 2M

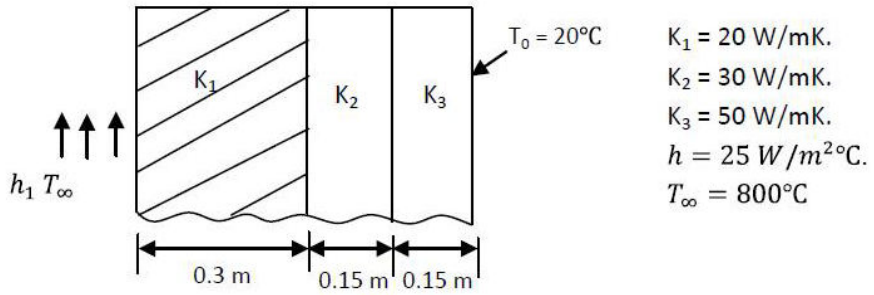
OR

Q.6 a. Using natural coordinates derive the shape function for a linear quadrilateral element. 5M

b. Derive inverse of the Jacobian transformation matrix for 3D tetrahedral elements. 7M

UNIT-IV

Q.7 a. A composite wall consists of 3 materials shown in figure below. The outer temperature is T0 = 20. Convection heat transfer takes place on the inner surface of the wall with T∞=800OC and h = 25 W/m2K. Determine the temperature distribution in the wall. 10M



b. Write the governing equation for one dimensional heat conduction. 2M

OR

Q.8 a. Derive the Finite element equation for torsional bar element 10M

b. Write a Short note on Thermal Load Vector 2M

UNIT-V

Q.9 a. Write a note on contour plotting. 6M

b. Derive an expression for least square fit for a four noded quadrilateral. 6M

OR

Q.10 a. What are the salient features of any finite element package? 6M

b. Write the advantages and disadvantages of computer Implementation. And also mention the applications. 6M

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