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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
M.Tech I Year I Semester Regular & Supplementary Examinations February 2018
FINITE ELEMENT ANALYSIS IN THERMAL ENGINEERING
(Thermal Engineering)

Time: 3 hours Max. Marks:60

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

UNIT-I

1 a. Explain basic steps involved in finite element analysis. 6M

b. Compare finite element method with finite difference method. 6M

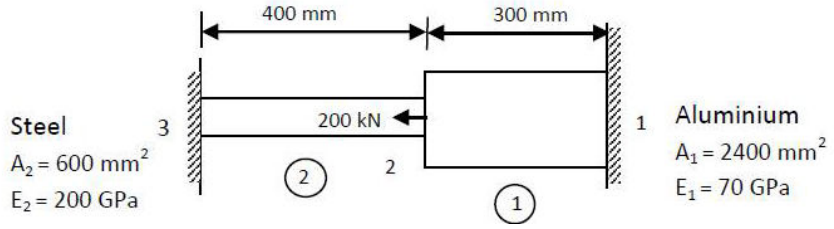
OR

2 a. Derive the strain displacement relationship for 2D situation. 6M

b. How are boundary conditions treated in handling finite element equation? What are the approaches referred? 6M

UNIT-II

3 a. A stepped bar is shown in the figure given below. Determine the nodal displacements and nodal forces.



5M

b. Derive the stiffness matrix for plane stress element. 7M

OR

4 a. Derive shape functions for one dimensional two noded beam element. Hence explain the conditions that the shape function has to satisfy. 5M

b. Explain the steps involved in analysis of beams with the help of a simple example and how boundary conditions are applied 7M

UNIT-III

5 a. Explain in detail the applications of isoparametric elements in two and three dimensional stress analysis 5M

b. Derive the element stiffness matrix of a CST element for plane stress condition. 7M

OR

6 a. Using natural coordinates derive the shape function for a linear quadrilateral element. 4M

b. Write short notes on:

(i) Uniqueness of mapping of iso-parametric elements.

(ii) Gaussian quadrature integration technique. 8M

UNIT-IV

7	a.	A composite slab consists of three materials of thermal conductivities 12W/mK, 20 W/mK, 40 W/mK and lengths 0.15 m, 0.3 m, and 0.2 mrespectively. The composite slab has a uniform cross section of 0.05 m^2.The left end of the slab is at 500 ^oC and the right end is exposed to theconvective heat transfer coefficient of 12 W/m^2K at 25 ^oC. Determine thetemperature distribution within the wall.	8M
	b.	Write the governing equation for one dimensional heat conduction.	4M

OR

8	a.	Explain with examples of boundary conditions in one dimensional heat conduction.	7M
	b.	Derive the basic differential equation in heat transfer analysis.	5M

UNIT-V

9	a.	Write a short notes on (a) Mesh generation (b) Transient heat conduction analysis.	8M
	b.	"FEM is best suited for computer implementation". Justify the statement.	4M

OR

10	a.	Write short notes on (a) Preprocessing (b) Elements connecting.	6M
	b.	Write the advantages and disadvantages of computer Implementation. And also mention the applications.	6M

***** END *****