Code No: 136BW JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD B. Tech III Year II Semester Examinations, May - 2019 FINITE ELEMENT METHODS (Common to ME, AE, MSNT)

Time: 3 hours

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

(25 Marks)

1.a)	Write the temperature load vector in the matrix form of a one dimensional bar	element.
		[2]
b)	How the order of the assembled global stiffness matrix is decided?	[3]
c)	What is force transformation matrix in a truss element?	[2]
d)	What assumptions are made in classical beam theory?	[3]
e)	Differentiate LST and CST Element.	[2]
f)	What are non zero stress components of axisymmetric element.	[3]
g)	Write the governing equation and the functions used into determine the	shearing
	stresses.	[2]
h)	What are the various boundary conditions of heat convection to take place?	[3]
i)	Describe the features of NASTRAN software.	[2]
j)	What are the convergence requirements of a finite element model?	[3]

PART - B

(50 Marks)

[10]

- 2. Derive finite element equation using galerkins method for one dimensional bar element. [10]
 - OR
- 3. Derive the element stiffness matrix for a one dimensional quadratic element. [10]
- 4. Determine the nodal displacement of the following figure 1.



5. Determine the shear forces and bending moments for the cantilever beam having length 'l'. [10]



Max. Marks: 75

6. Derive the element stiffness matrix for triangular element and thus find the matrix element for the triangular element as shown in figure 2. [10]



7. Derive the element stiffness matrix for the following axisymmetric ring of triangular cross section (figure 3). [10]



Figure 3

- 8. Derive the element stiffness matrix of a thin plate. [10] OR
- 9. Derive the stiffness matrix for heat flow in a rectangular fin, where k, h and P denotes thermal conductivity, convective heat coefficient and perimeter of fin and A is area of cross section of fin. [10]
- 10. Find the natural frequency of the following truss bar (figure 4). [10]



OR

11. Draw the mode shapes of the following stepped bar. Take E= 200 GPa, specific weight 7850 kg/m³. Take $A_1 = 400$ mm², and $A_2=200$ mm² (figure 5). [10]

