R16

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 **Max. Marks: 75**

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)

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. [10]

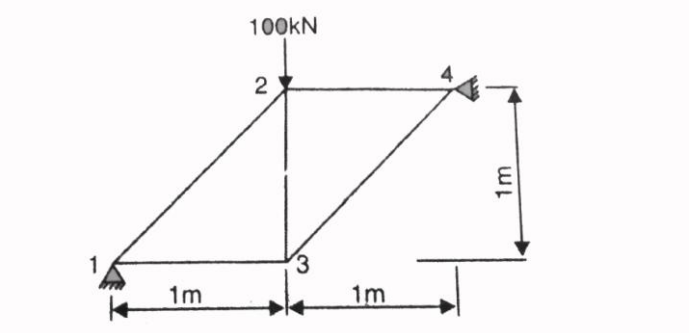

Figure 1

OR

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

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]

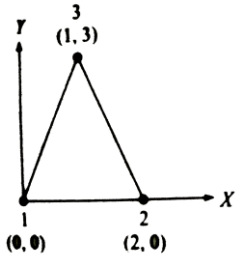

Figure 2

OR

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

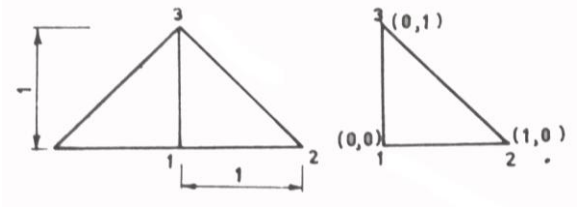

Figure 3

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]

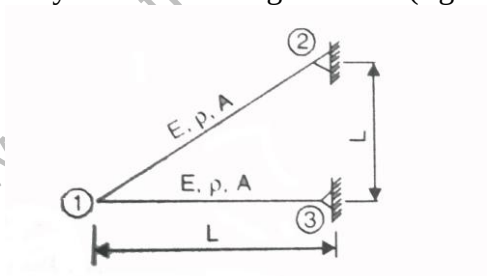

Figure 4

OR

11. Draw the mode shapes of the following stepped bar. Take E= 200 GPa, specific weight 7850 kg/m^3. Take A_1 = 400 mm^2, and A_2=200 mm^2 (figure 5). [10]

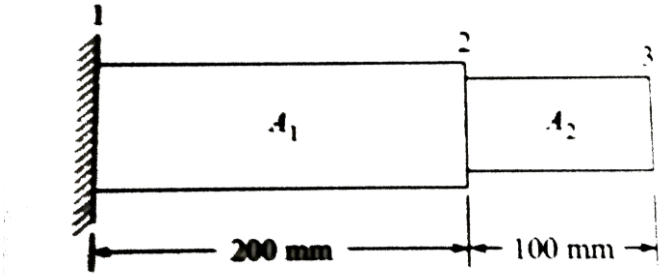

Figure 5