R15

Code No: 126VE

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, April - 2018
FINITE ELEMENT METHODS
(Common to AE, MSNT, ME)

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)	What boundary conditions are imposed for 1 Dimensional bar element.	[2]
b)	Discuss the shape functions of one dimensional quadratic element.	[3]
c)	Write the hermitian shape function of a beam element.	[2]
d)	How local and global coordinates are related in a truss problem.	[3]
e)	What are the properties of a triangular coordinates.	[2]
f)	Write the strain displacement equation of axisymmetric problems using a cylindrical coordinate system.	[3]
g)	List one requirement which is sufficient for convergence for a plate element.	[2]
h)	Write governing differential equation for two dimensional heat transfer problem	[3]
i)	Describe the features of NISA software.	[2]
j)	Differentiate lumped and consistent mass matrix.	[3]

PART - B

(50 Marks)

2. Derive the stiffness matrix and consistent load vector in matrix form for one dimensional quadratic element. [10]

OR

3. Explore the stress strain relation for 2D and 3D elastic problems. [10]

4. Determine the nodal displacement of the following truss as shown in figure 1. [10]

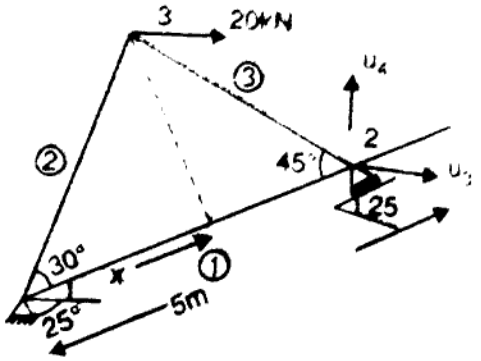

Figure 1

OR

5. Determine the slope and vertical deflection at the centre for the following beam figure 2. [10]

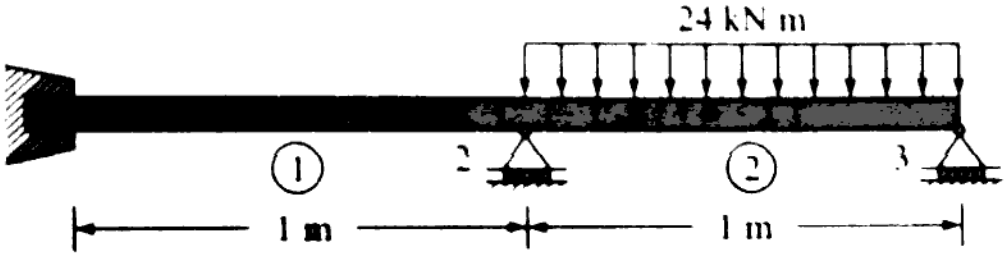

Figure 2

6. Derive the area and strain displacement matrix for the triangular element and thus calculate the same for the triangle as shown in figure 3. [10]

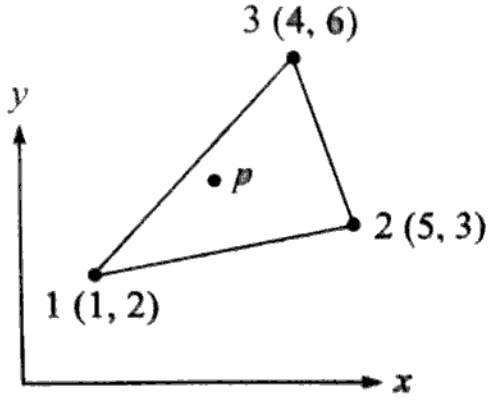

Figure 3

OR

7. Derive the element stiffess matrix for the following figure 4 axisymmetric annular ring element. [10]

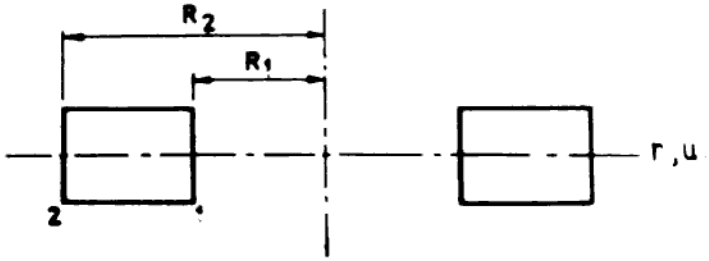

Figure 4

8. Use galerkin's approach to find the stiffness matrix of a torsional triangular element. [10]

OR

9. Determine the temperature distribution in a fin having rectangular cross section and is 8 cm long, 4 cm wide and 1 cm thick. Assume convection heat loss occurs from the free end of the fin. One end is fixed. Take k=3 W/cm^{0}C, h= 0.1 W/cm^2 ^{0}C and T∞=20^{0}C. [10]

10. Find the natural frequency of the following truss bar figure 5. [10]

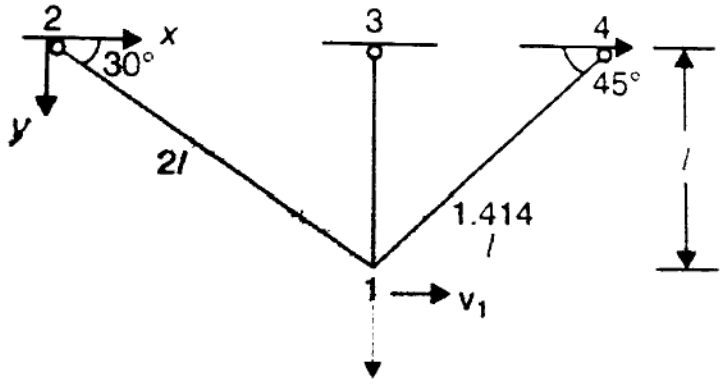

Figure 5

OR

11. Derive the eigen values and eigen vectors of the stepped bar. Assume the required data. [10]

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