Code No: 126EE

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, October/November - 2016

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) Differentiate finite element method and finite difference method. [2]
b) Bring out the difference between plane stress and plane strain problems. [3]
c) What are the consistent nodal force vector for uniform load and varying load? [2]
d) What are the various functions considered under classical beam theory? [3]
e) How triangular elements are isoparametrically represented. [2]
f) How axisymmetric element can be equalized to the CST element. [3]
g) Write the governing equation for the torsional analysis of non circular shafts. [2]
h) Formulate the equation of one dimensional criteria of composite wall. [3]
i) Distinguish between consistent and lumped mass matrix. [2]
j) What is characteristic polynomial technique? [3]

PART - B

(50 Marks)

2. Using polynomial function, derive the shape function of a bar element. [10]

OR

3.a) Formulate the stress strain relations for 2D and 3D elastic problems.
b) Assemble the global stiffness matrix and load vector for a bar element. [5+5]

4. Determine the stresses and reaction for the following truss element. Given E=200GPa and A = 2000 mm^2. (Figure 1) [10]

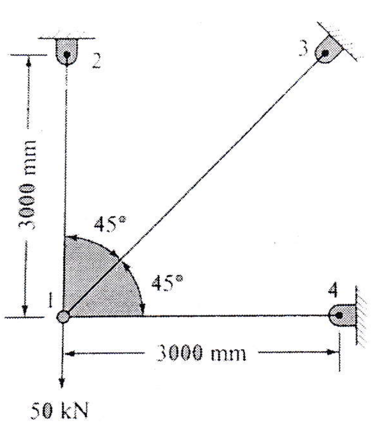

Figure 1

OR

5. Derive Hermite Shape function for the beam element. [10]

6. For the axisymmetric element shown in Figure 2, determine the element stiffness matrix. Take E=200 GPa, and υ=0.3. [10]

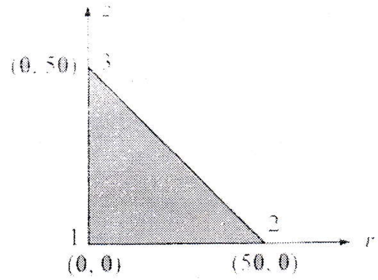

Figure 2

OR

7. Derive the jacobian matrix of a hexahedral element. [10]

8. Evaluate the nodal values of a shaft of 10 mm square. Given $G = 8 \times 10^6$ N/cm^2 and ϕ=0.01 degree/cm. Use only one eighth of the cross section. (figure 3) [10]

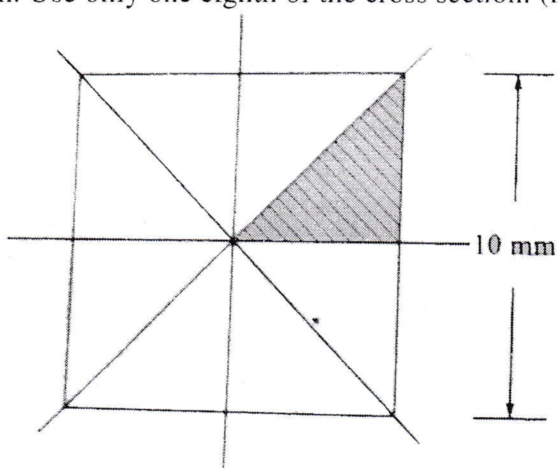

Figure 3

OR

9. For the two dimensional body as shown figure 4, determine the temperature distribution. The left and right ends have constant temperatures of 200^{0}C and 100^{0}C respectively. Take k=5 W/cm^{0}C. The body is insulated along the top and bottom. [10]

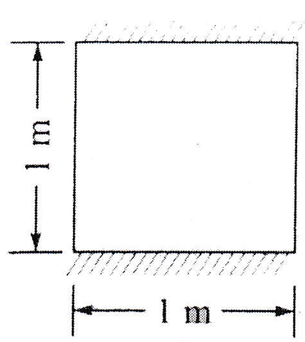

Figure 4

10. Evaluate eigen values and eigen vectors for a cantilever beam of length 1 m, supported at the other end. Take $E = 200GPa$, $I = 40 \times 10^{-10}\ m^4$, $A = 2 \times 10^{-4}\ m^2$ and weight density = 7850 kg/m^3. Use one element method. [10]

OR

11. Evaluate nodal frequency of the beam shown in Figure 5. Use two element model and take E=210 GPa, weight density 7800 kg/m^3, $A=400\ mm^2$, and $I = 5000\ mm^4$. [10]

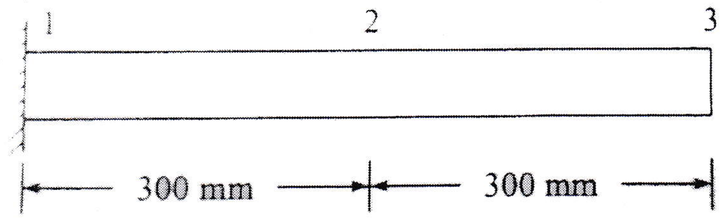

Figure 5

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