Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

FEME 6301

Sixth Semester Examination – 2013

FINITE ELEMENT METHOD

BRANCH : MECHANICAL / MANUFACT / MANUTECH.

QUESTION CODE : A 238

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) Where Finite element method is used ?

   (b) What is discretization ?

   (c) What types of element are used in finite element method ?

   (d) What is an isoparametric element ? State its importance in finite element method.

   (e) Give examples of axisymmetric problems.

   (f) How nodes are selected ?

   (g) Write down the properties of shape functions.

   (h) Write down the equation for potential problems.

   (i) What is post processing in FE analysis ?

   (j) What are the different commercial FE codes available ?

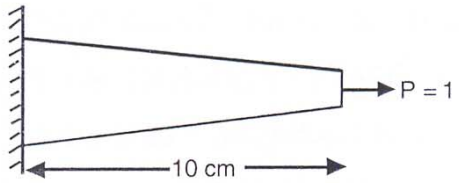
2. (a) Explain the basic steps involved in FEM. 5

   (b) Write the advantages, disadvantages and limitations of FEM. 5

3. Derive the shape functions and strain displacement matrix for a 2-noded on dimensional element. 10

P.T.O.

4. Find the stress distribution in the tapered bar shown in Figure below using two finite elements under an axial load of P = 1 N. The Cross sectional area at root = 2 cm^2, Cross sectional area at end = 1 cm^2
Young's modulus = 2 $\times 10^7$ N/cm^2 10



5. (a) Write the stress-strain relation for an isotropic material in solving axisymmetric problem. 4

(b) Derive the shape functions for a typical triangular element in solving axisymmetric problem. 6

6. (a) Describe the variation approach used in finite element method. 4

(b) Find out the shape functions for a 2-D frame structure. 6

7. A triangular-element has node points located at ($x_1 = 2, y_1 = 2$), ($x_2 = 7, y_2 = 2$) and ($x_3 = 4, y_3 = 5$). The nodal value of the temperature at node1, node 2 and node 3 are 30°C, 45°C and 55°C respectively. Use the interpolating function for a three-noded triangular element and compute the value of at (x = 4, y=3). 10

8. Write short notes on any **two** : 5×2

(a) Minimum potential energy principle

(b) Plane stress and plain strain problems

(c) Galerkin method

(d) Constant Strain Triangle elements.
