53 (CE 813) FEME

2017

FINITE ELEMENT METHODS IN ENGINEERING

Paper : CE 813

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any ten*** *questions out of* ***eleven.***

1. What do you understand by the term stiffness ? Determine the stiffness matrix of a bar element. 3+7=10

2. What is plane strain and plane stress problem ? Explain with suitable examples and write down their constitutive relationships. 4+6=10

3. What is equilibrium conditions ? Derive the equilibrium conditions for 3-dimensional stress distributions. 3+7=10

4. Write the Pascals triangle used for forming polynomial equations. Write down the polynomial equations for 4 noded and 8 noded element. 3+7=10

5. Discuss with suitable figures the various element types used in FEM modelling. 10

6. What is shape function ? Derive the expression for shape function of a three noded triangular element in natural coordinate system. 3+7=10

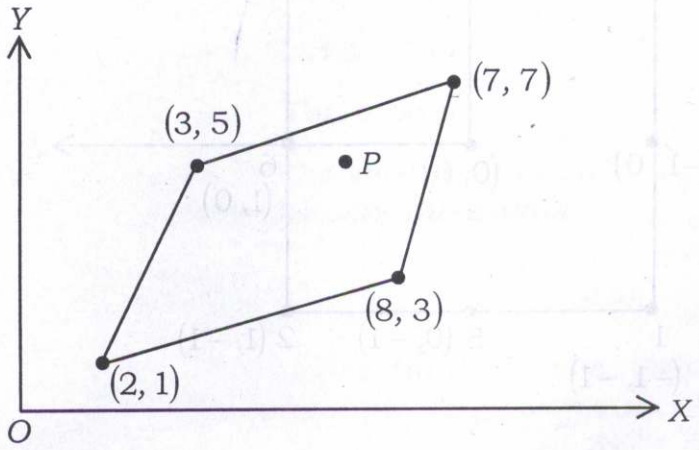
7. Using generalized coordinate approach, find the shape function for two noded bar element. 10

8. Find the shape function of a tetrahedral element using local coordinate system.

10

9. Determine the Cartesian coordinate of the point $P(\xi = 0{\cdot}5, \eta = 0{\cdot}6)$ as shown below :

10



10. What is non-linear FEA ? What are the different types of non-linearities in F.E.A. ?

3+7=10

11. Using Lagrange functions, determine the shape functions for 8 noded 2-D rectangular element. 10