53 (CE 813) FEME

2018

FINITE ELEMENTS METHODS IN ENGINEERING

Paper : CE 813

Full Marks : 100

Time : Three hours

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

*Answer **all** questions.*

1. What do you understand by stiffness? Derive the expression for stiffness matrix of a 3-noded bar element. 3+7=10

2. State the advantages and disadvantages of Finite Element Method in Engineering. 5+5=10

3. What is constitutive relationship? Explain with suitable examples the plane stress and plane strain problems. 4+6=10

4. What is state of stress at a point? Derive the equilibrium condition for 3-dimensional stress distribution. 3+7=10

5. Explain the concept of isoparametric element and state the main theorem of isoparametric theory. 10

6. Explain non-linear finite element analysis techniques and explain the available methods to solve it. 10

7. What is shape function? Determine the shape function for 8-noded quadrilateral element. 3+7=10

8. With the help of Lagrange's interpolation function, determine the shape function for 8-noded two-dimensional rectangular element. 10

9. Integrate the following: 5+5=10

(i) $\int_0^l L_1 L_2 \, dx$

(ii) $\int_0^l L_1^2 L_2 \, dx$.

10. Explain the following: 5+5=10

(a) Rayleigh-Rit Method

(b) Principle of Minimum Potential Energy.
