Total No. of Questions : 8]   [Total No. of Printed Pages : 2

Roll No

MVSE-202
M.E./M.Tech. II Semester
Examination, November 2018
FEM in Structural Engineering

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any Five questions.
   ii) All questions carry equal marks.

1. a) Discuss the advantages and disadvantage of FEM.

   b) Write step by step procedure in FEM by any suitable example.

2. Explain Gaussian elimination method for solving simultaneous equation. Solve following equations by Gaussian elimination or Cholesky's method.

$$\begin{bmatrix} 4 & 2 & 4 & 5 \\ 3 & 9 & 12 & 10 \\ 2 & 4 & 11 & 12 \\ 1 & 2 & 4 & 8 \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{Bmatrix} = \begin{Bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{Bmatrix}$$

3. a) Explain the convergence criteria and what are the basic requirements of it.

   b) Derive the shape function for a three noded triangular element using polynomials.

4. What are the factors to be considered in the selection of interpolation function? Derive the shape function for eight noded rectangular element using Lagrangian interpolation function.

5. Explain Gaussian quadrature and find the gauss points and corresponding weight for 1 point and 2 point method of integration.

6. Find the displacement in the axially loaded stepped bar shown in figure below. The bar cross-sectional area is $A^{(1)}=4cm^2$ and $A^{(2)}=2cm^2$, $l^{(1)}=l^{(2)}=12cm$, $E^{(1)}=E^{(2)}=2\times10^7 N/cm^2$, $P_3=20N$.
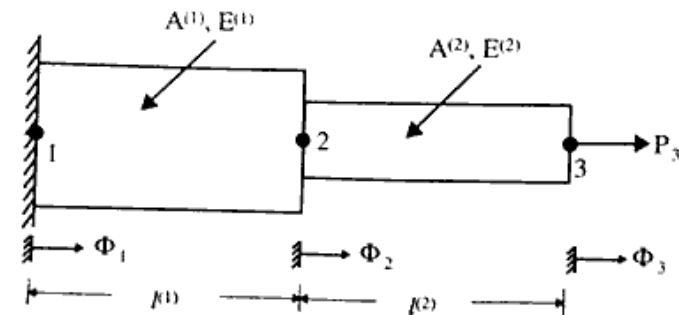
7. What is isoparametric formulation? Determine the shape function, Jacobian matrix and element stiffness matrix for 2-D four noded isoparametric quadrilateral element.

8. Write short notes on any four:

   a) Skyline storage technique

   b) Uniqueness of mapping

   c) Hermite interpolation function

   d) Iterative method of solution

   e) Aspect ratio of elements