Or

Explain Jacobi or Power method for finding eigen values and eigen vectors. Find the eigen values and eigen vectors of following matrix.

$$A=\begin{bmatrix}1 & 2 & 0\\ 2 & 2 & 0\\ 0 & 0 & -1\end{bmatrix}$$ 14

3. What are the criteria in selecting interpolation polynomials? Explain convergence requirements in finite element formulation. Derive the shape function for a four noded plate bending element by Lagrangian Interpolating function. 14

Or

Describe Discretisation process of the Domain in the finite element method in detail. 14

4. Describe numerical integration methods with their application and importance. Integrate the function $f(r) = 1+r+r^2+r^3$ between the limits-1 and 1 using exact and numerical integration methods and compare the results. 14

Or

What is the use of Hermitian Interpolation function? Derive shape functions for a 6-noded quadrilateral element. 14

5. Write short notes on any three of the following: 14
   a) Assembly of element characteristic matrices and vectors
   b) Isoparametric, Subparametric and Superparametric elements
   c) Incorporation of Boundary conditions
   d) Plane stress and plane strain element
   e) Formulation of Equilibrium equations.

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Total No. of Questions :5] *[Total No. of Printed Pages :2*

Roll No .....

MVSE - 202

M.E./M.Tech., II Semester

Examination, June 2014

FEM in Structural Engineering

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt all five questions. All questions carry equal marks.
ii) Assume suitable data, if necessary.
iii) Units of quantities used/calculated must be stated clearly.

1. Describe briefly the steps of finite element method. Analyse an axially loaded 1.2 m long Tapered bar fixed at one end subjected to an axial pull of 12 kN at the free end. Area at fixed end is 210 mm^2 and at free end is 150 mm^2. Modulus of Elasticity (E) = 2×10^5 N/mm^2. Consider minimum three steps of the bar for the analysis. 14

Or

Find the approximate deflection of a simply supported beam under a uniformly distributed load using Rayleigh-Ritz, Galerkin, Finite Difference and Finite element Method. 14

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

$$\begin{bmatrix}4 & 2 & 4 & 5\\ 3 & 9 & 12 & 15\\ 2 & 4 & 11 & 10\\ 1 & 2 & 4 & 10\end{bmatrix}\begin{Bmatrix}x_1\\ x_2\\ x_3\\ x_4\end{Bmatrix}=\begin{Bmatrix}1\\ 1\\ 1\\ 1\end{Bmatrix}$$ 14