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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Eighth Semester

Branch : Civil Engineering

FINITE ELEMENT ANALYSIS (C)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours

Maximum : 100 Marks

Answer **all** *questions.*
Each full question carries 20 *marks.*

I. (a) For the problem of axial vibration of a tapering rod fixed at one end and free at the other, derive the governing differential equation.

(b) Briefly explain the basic steps involved in finite element analysis using a suitable example.

Or

II. (a) Explain the Gauss elimination procedure with an example.

(b) Explain the concept of frontal solvers with an example.

III. (a) Explain the formulation of finite element equations using Rayleigh-Ritz approaeh.

(b) Explain the principle of virtual work in detail.

Or

IV. (a) Discuss the roll of energy principles in finite element formulations.

(b) Explain the principle of virtual displacements.

V. (a) Get the explicit shape functions for a rectangular element with corners (0,0), (3,0), (3,2), (0,2), using Lagrange formulae.

(b) Explain Cn continuity with examples.

Or

VI. (a) List and explain the essential properties of shape functions for monotonic convergence.

(b) Explain : (i) Constant Strain Triangular element ; and (ii) Area co-ordinates.

VII. Evaluate the following integrals using Gauss quadrature :—

(a) $I = \int_{-2}^{2} \frac{dx}{1+x^2}$

(b) $I = \int_{-1}^{1}\int_{-1}^{1} x \sin\left(x + y^2\right) dxdy.$

Or

VIII. (a) Derive the shape functions for a 4-noded bar element using Lagrangian interpolation.

(b) Derive the shape functions for a 2-dimensional beam element and show the variation of shape functions graphically.

IX. (a) Explain Mindlin's plate bending theory.

(b) Explain reduced integration. Under what circumstances reduced integration is advantageous?

Or

X. (a) Discuss axisymmetric problems and state the stress-strain and strain-displacement relations for axisymmetric problems.

(b) Explain how to arrive at the nodal force vector when one side of an axisymmetric triangular element is subjected to uniformly varying load.

(5 × 20 = 100 marks)