

Total No. of Questions : 8]

SEAT No. :

P4063

[5255]-561

[Total No. of Pages : 2

M.E. (Mechanical) (Design Engineering)
FINITE ELEMENT METHOD
(2013 Credit Pattern) (Theory) (Semester - II) (502209)

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any five questions*
- 2) *Neat diagrams should be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Use of scientific calculator is permitted.*
- 5) *Assume suitable data, if necessary.*

Q1) a) Explain LINEAR shape functions. **[5]**

b) Describe sources of errors in FEM with suitable examples. **[5]**

Q2) Explain following terms in brief. **[10]**

- a) Physical Model.
- b) Mathematical model with differential equation.
- c) FEM Model.
- d) Element Matrix Equation.
- e) Iso-parametric Equations.

Q3) Evaluate integral $I = \int_{-1}^1 (x^3 - 4x^2 + 2x + 8) dx$ by **[10]**

- a) Gauss 2 Point Formula
- b) Gauss 3 Point Formula

Q4) a) Explain how node numbering affects the bandwidth of stiffness matrix in FEM. **[5]**

b) Differentiate between Galerkin and Rayleigh Ritz Finite element formulations. **[5]**

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Q5) Explain why a linear triangular element (CST) is a stiff element. Suggest suitable remedies for this element in industry practice. **[10]**

Q6) Compare Linear and Non-linear Finite Element Analysis with respect to **[10]**

- a) Load-Displacement Relation.
- b) Stress-Strain Relation.
- c) Superposition.
- d) Reversability.
- e) Solution Scheme.

Q7) Classify different types of dynamic problems. Mention and Differentiate between implicit and explicit time integration schemes. **[10]**

Q8) Explain what do you understand by Submodeling and substructuring. Give practical examples where these approaches are useful. **[10]**

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