C 61487 (Pages 2) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2014

(2009 Scheme)

ME/PTME 09 602—FINITE ELEMENT METHOD

(Regular/Supplementary/Improvement)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

Each question carries 2 *marks.*

1. Define element stiffness matrix for a plane truss element.
2. What is meant by pre processing ?
3. Differentiate local and global co-ordinate system.
4. What is weak formulation ?
5. What is Gauss quadrature ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

Each question carries 5 *marks.*

6. Derive element stiffness matrix for a beam element.
7. Explain bandwidth of a stiffness matrix.
8. Derive the strain displacement matrix for a bar element..
9. How do we arrive at global stiffness matrix ? What is its importance ?
10. Which are the two major methods of mesh refinement ? Also explain its importance in FEA.
11. "Isoparametric elements uses shape functions to interpolate displacement field and element geometry" – Explain.

(4 × 5 = 20 marks)

Turn over

Part C

Answer **all** *questions.*

MODULE I

12. Explain in detail the steps involved in the structural problem of FEM with a suitable example.

Or

13. Briefly describe the historical development of FEM as a numerical tool. Explain the advantages and limitations of FEM.

MODULE II

14. Explain a constant strain triangular Element. Write the displacement in terms of nodal displacements. Also write the strain components in terms of nodal displacements.

Or

15. What are the properties of Shape functions ? Explain Lagrange's one dimensional linear and quadratic interpolation formulae with a plot.

MODULE III

16. Derive the conductance matrix for two dimensional heat transfer and explain its boundary conditions.

Or

17. Determine the deflection of a cantilever beam of length L and loaded with a vertical load P at the free end by Rayleigh Ritz method. Use a trial function, $y = a\left(1 = \cos\left(\frac{\pi s}{2L}\right)\right)$.

MODULE IV

18. Describe the derivation of Finite Element equations using Galerkin Approach.

Or

19. Write short notes on any *three* of the following :—

    (a) Isoparametric Elements.

    (b) Gaussian Quadrature.

    (c) Jacobian Matrix.

    (d) Weighted Residual Methods.

(4 × 10 = 40 marks)