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Total No. of Pages : 02

Total No. of Questions : 08

## M.Tech (ME) (Sem.–1) FINITE ELEMENT ANALYSIS Subject Code : MTME-102 M.Code : 74716 Date of Examination : 16-01-2023

## Time: 3 Hrs.

Max. Marks : 100

## **INSTRUCTIONS TO CANDIDATES :**

- 1. Attempt any FIVE questions in all.
- 2. Each question carries TWENTY marks.
- 1. a) What do you understand by isoparametric mapping? What are the convergence criteria for the isoparametric element?
  - b) Discuss any one technique used for solving three-dimensional integration problems, by taking a suitable example.
- 2. a) What is a global stiffness matrix? How will you assemble a global stiffness matrix for a single truss element?
  - b) Using the first theorem of Castigliano, develop a flexure element for properly exhibiting transverse bending effects.
- 3. a) What is a shape function? What are the different types of shape functions used in Finite element analysis?
  - b) Differentiate between a truss element and a flexure element. Discuss the elementary beam theory used for developing flexure elements.
- 4. For four-noded isoparametric quadrilateral Element, derive shape functions in natural coordinates and obtain Jacobian matrix.
- 5. Analyze a simply supported beam subjected to a uniformly distributed load throughout using Rayleigh Ritz method. Adopt one-parameter trigonometric function. Evaluate the maximum deflection and bending moment and compare with the exact solution.

- 6. Develop a one-dimensional finite element model of heat transfer including both conduction and convection for a solid cylindrical body surrounded by a fluid medium. Assume boundary conditions.
- 7. Derive the governing equations for a general three dimensional flow. How will you modify this equation for steady flow of an incompressible fluid?

## 8. Write short notes on :

- a) Difference between boundary value and initial value problems.
- b) Pre and Post processing in FEA.
- c) Weighted residual's method.
- d) Stream functions.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.