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Total No. of Pages : 02

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## M.Tech. (ME) (2017 Onwards) (Sem.–1) FINITE ELEMENT ANALYSIS Subject Code : MTME-102 M.Code : 74716

Time : 3 Hrs.

Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

- 1. Attempt any FIVE questions out of EIGHT questions.
- 2. Each question carries TWENTY marks.
- 1. a) Discuss the general procedure for finite element analysis of physical problems.

b) What is the purpose of isoparametric elements in FEA?

- 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. The differential equation for a phenomenon is given by  $(d_2y/d_{x2}) + 500x^2 = 0$ ;  $0 \square x \square 5$ . The boundary conditions are y(0) = 0 and y(5) = 0. Find the approximate solution using any classical technique. Start with minimal possible approximate solution.
- 4. For four-noded isoparametric quadrilateral element, derive shape functions in natural coordinates and obtain Jacobian matrix.
- 5. Determine the nodal displacements for the two member rigid frame as shown in the figure. Assume I = 400 cm2, A = 30 cm2 and E =  $20 \times 106$  N/cm2 for both members.



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- 6. Derive the expression of shape function for heat transfer in a 2-D element
- 7. Develop finite element formulation based on stream function for 2-dimensional flow.
- 8. Write short notes on :
  - a) Essential and natural boundary conditions.
  - b) Reduction of 3-dimensional problems to 2-dimensional problems.
  - c) Galerkin's residual method.
  - d) CST elements.

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