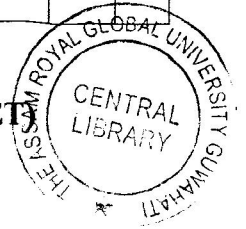


Roll No:

The Assam Royal Global University, Guwahati  
ROYAL SCHOOL OF ENGINEERING AND TECHNOLOGY (RSET)  
M.TECH SE, 2ND SEMESTER  
Special Supplementary Examination, September 2023  
Course Title: Fem In Structural Engineering  
Course Code: CEE024C20S1



Time: 3 Hours

Maximum Marks: 70

Note: Attempt all questions as per instructions given.  
The figures in the right-hand margin indicate marks.

Section – A

1. Attempt **all** questions. (Maximum word limit 50) 2 x 8
- a. What is a structural system.
  - b. What are the two stages in Fem?
  - c. In weighted residual method, what are the different methods that can be used to find the approximate solution?
  - d. What method is used to solve boundary value equations? Write a few lines.
  - e. In general element formulation, what is completeness condition?
  - f. What are the required conditions for a problem to be axisymmetric?
  - g. What is a CST element?
  - h. Write the equilibrium equation for plane stress.

Section – B

2. Attempt **any two** of the following: 6 x 2
- a. In brief, write about the applications and advantages of FEM.
  - b. Classify the structural system based on geometry and efficiency.
  - c. Differentiate between the classical method and FEM.
3. Attempt **any two** of the following: 7 x 2
- a. A cantilever beam of 3m span is subjected to a concentrated load of 2 kN at the free end. Determine the maximum deflection. Take  $E=200$  GPa.  $I= 10^8$  mm<sup>4</sup>
  - b. Specify the assumptions of elementary beam theory.
  - c. Derive the beam load vector of a beam of length 6 m with fixed support at node 1 and pinned support at node 2. An udl of 6 kN/m is acting from node 1 to 3m.
4. Attempt **any two** of the following: 7 x 2
- a. Use the monomial method to obtain the interpolation functions for the four-node line element as shown in figure:1

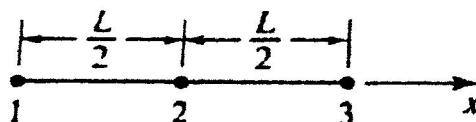


Fig 1

- b. Derive the interpolation function for a beam element with four degrees of freedom.
  - c. Find the interpolation function for a rectangular element for 4 nodal linear structures.
5. Attempt **any one** of the following: 14 x 1
- a. Formulate the finite element for a three-dimensional stress element.
  - b. Determine the total strain energy of a body under plane stress.