Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH DEGREE EXAMINATION (Regular), JULY 2022

STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

(2021 Scheme)

Course Code: **21SC201**

Course Name: **Finite Element Analysis**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Demonstrate idealization to mathematical model in FEA with an example.
2. Explain neutral equilibrium with the help of an example.
3. Discuss guidelines to be considered while choosing appropriate functions in FEA.
4. What criteria gives CST and LST their names?
5. Differentiate C^0 and C^1 continuity elements.
6. How do you calculate the size of global stiffness matrix?
7. Explain shear locking in Mindlin's element.
8. What are spurious modes?

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

9. Explain various elements used in the modeling of finite element analysis problems. (6)

OR

10. Explain the procedure involved in finite element analysis using displacement approach. (6)

MODULE II

11. Using different weighted residual methods solve a cantilever bar problem subjected to a uniformly varying load q(x) = cx, where c is a constant. (6)

OR

12. Using variational principles derive differential equation and boundary conditions for a bar extending by its own self weight and having a point load at its end. (6)

MODULE III

13. Derive shape function for bilinear plane rectangular element using Lagrangian interpolation function. (6)

OR

14. Derive shape function for a two noded beam element. (6)

MODULE IV

15. Derive element stiffness matrix for a plane stress CST element. (6)

OR

16. Derive stiffness matrix for a two noded beam element. (6)

MODULE V

17. Explain patch test. What is its significance in FEA? (6)

OR

18. Evaluate the following integral using two-point Gauss quadrature and compare with exact solution. (6)

$$I = \int_{-1}^{+1} \{ 3e^x + x^2 + (\frac{1}{x+2}) \} dx$$

MODULE VI

19. Compare Kirchhoff's and Mindlin's plate theories. Comment on suitability of the theories in plate bending. (6)

OR

20. Discuss finite element formulation of Kirchhoff's plate element. (6)

****