Register No.: …… Name: ……

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SECOND SEMESTER M.TECH. DEGREE EXAMINATION (Special), AUGUST 2021
STRUCTURAL ENGINEERING AND CONSTRUCTION MANAGEMENT

Course Code: **20CESCT106**

Course Name: **THEORY OF PLATES AND SHELLS**

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

PART A

(Answer all questions. Each question carries 3 marks)

1. Define thin plate and thick plates
2. Prove that if a thin rectangular plate is acted with equal pure moments along the sides, the twisting moment vanishes throughout the domain of the plate.
3. Derive the boundary conditions to be used for a clamped edge and a free edge.
4. Find the maximum deflection for a simply supported rectangular plate subjected to sinusoidal load? Take $\mu = 0.3$.
5. List the uses of circular plates.
6. Develop the boundary condition of circular plate with simply supported edges with figure.
7. Define ruled surface, singly curved surface and doubly curved surface.
8. Explain the classification of folded plates with neat sketches.

PART B

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

MODULE I

9. Compare thin plates with small deflection, thin plates with large deflection, thick plates and shells. (6)

OR

10. Derive the differential equation for cylindrical bending of plates. (6)

MODULE II

11. Derive the expression for moments in terms of curvature in pure bending. (6)

OR

12. Prove that at any point in the middle surface, the sum of curvatures in two mutually perpendicular directions are independent of angle α. (6)

MODULE III

13. Derive the governing differential equation for Kirchhoff plates. (6)

OR

14. Describe the solution techniques for the fourth order Kirchhoff's plate equation. (6)

MODULE IV

15. Derive the expressions for deflection and stress couples of a thin rectangular plate subjected to static sinusoidal loading, varying along the plan dimensions, using Navier's method. (6)

OR

16. Develop the expression for deflection for a simply supported rectangular plate of size $a \times b$ subjected to udl. Use Levy's method (6)

MODULE V

17. Develop from first principles, governing differential equation for circular plate under axisymmetric loading. (6)

OR

18. Derive the governing equation for symmetrically loaded circular plates in polar coordinates. (6)

MODULE VI

19. Derive the equilibrium equations for membrane analysis of thin cylindrical shells. (6)

OR

20. Explain the structural action of folded plates. (6)

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