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M.Tech. 1st Semester (Civil Engg.) Examination,

November-2023

**ANALYSIS AND DESIGN OF PLATES AND
SHELLS**

Paper-CE-613

Time allowed : 3 hours] [Maximum marks : 100

Note : Attempt any five questions.

1. (a) Write the structural components of cylindrical shells with neat sketch mention the various loads acting on the shell. 10
- (b) Write the assumptions made in membrane theory of shells. 10
2. What do you mean by 'Shells of Revolution' and 'Shells of Translation'? Explain them with neat sketches. Proceeding from the equilibrium equations, arrive at the general expressions for the membrane stress resultants in the case of circular cylindrical shell. Hence obtain the stress resultants under dead and snow loads for 'Fourier'. 20

3. (a) Using the Navier solution obtain general equation for a concentrated load on a simply supported rectangular plate. 10
- (b) Express the equilibrium equations in polar coordinates of a circular plate. 10
4. Design a hyper shell roof of inverted umbrella type to suit the following data : Area covered in plan = $28\text{m} \times 28\text{m}$; Use M30 concrete and Fe500 grade steel. Sketch the details of reinforcement in the shell and edge beam. 20
5. A rectangular plate $a \times b$ simply supported at the edges is subjected to sinusoidal loading. Using the Navier solution, obtain the general expressions for deflection and bending moment. 20
6. (a) Explain the bending and membrane theories for analysis of shells. 10
- (b) Derive the membrane equation for shells. 10

7. A uniform loaded solid circular plate with radius 'a' has its edges simply supported, obtain the expressions for the maximum deflections and obtain bending moments. 20
8. (a) Derive the relations between bending moments and curvature in pure bending of plates. 10
- (b) Distinguish between thin plate with small deflection and thin plate with large deflection. 10