

Sub Code: **MSCT-314**

ROLL NO.....

**SEMESTER EXAMINATION, 2022-23  
YEAR**

Programme- 1st Yr. M.Tech – STRUCTURE AND CONCRETE ENGINEERING

**THEORY OF THIN PLATES AND SHELLS**

**Duration : 3:00 hrs**

**Max Marks: 100**

Note:-Attempt all questions. All Question carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption mad in the answer.

Q 1. Answer any four parts of the following.

- a) Explain the general theory of cylindrical shell loaded symmetrically with respect to its axis.
- b) Discuss the general guidelines followed for selecting the dimensions of the various structural components of a shell.
- c) Derive the expression for differential equation of cylindrical bending of plates.
- d) Derive expressions for deflection, shear force and bending moment for a circular plate with simply supported boundary conditions subjected to uniformly distributed loading.
- e) Describe Navier solution for simply supported rectangular plates.
- f) Explain design procedure of elliptic parabolic by membrane theory.

Q 2. Answer any four parts of the following.

- a) Give solutions to Shorer's differential equations
- b) How do you classify shells into long and short shells as per various theories.
- c) Write boundary conditions for simply supported cylindrical shells with the edge conditions or the end shells in a multiple group of shells.
- d) Obtain the modified equation in case of a plate subjected to in plane forces.
- e) What are the merits and demerits of plates.
- f) Explain the term of Annular Plates.

Q 3. Answer any two parts of the following.

- a) A simply supported circular cylindrical shell with free longitudinal edges is spanning 22m and radius of 10m and semicircular angle of 35 degrees. The edge beam has width of 300mm and depth of 1500mm. Determine stress resultants for  $N_x$   $N_0$   $N_x0$  under self weight using membrane theory. If there is an edge beam what is the maximum longitudinal force developed in the edge beam.

**b)** Write short notes on

- i) Ruled surface                      ii) Shells of translation                      iii) Shells of revolution with sketches

**c)** Design a cylindrical shell roof considering beam and arch action to cover a parking place 40 meters wide and 160 meters long. Superimposed load due to waterproofing cover and occasional live loads may be taken as 350 kg/m<sup>2</sup> of the surface of the shell. Slope at the ends may be taken as 40°. Thickness of the shell may be taken as 110mm. Dimensions of the edge beam may be assumed as 300mm by 1500 mm. Shell may be divided into four parts for arch action. Use M20 and Fe250 steel. Show the design details clearly.

**Q 4.** Answer any two parts of the following.

**a)** Write boundary conditions for simply supported cylindrical shells with the edge conditions.

- i) Single shell without edge beam                      ii) single shell with edge beam.

**b)** Elucidate the different classification of shells with neat sketches.

**c)** Explain the general case of deformation of a cylindrical cell.

**Q 5.** Answer any two parts of the following.

**a)** Express the equilibrium equations in polar coordinates of a circular plate.

**b)** Elucidate the boundary conditions in rectangular and circular plates for the following support conditions.

- i) Built-in edge                      ii) simply supported edge                      iii) free edge

**c)** Find out maximum deflection using Levi's solution for rectangular plate with one pair of edges is simply supported and other pair is fixed and subjected to uniformly distributed load of intensity  $q$ .

