

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER II (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2722013

Date: 31/05/2016

Subject Name: Plates and Shells

Time: 10:30 am to 01:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q 1 (a) Define Neutral plane, anticlastic, synclastic, inplane resistance, Stiffness factor, Surface and Shell surface. [07]
- Q 1 (b) Derive equations of equilibrium for general bending theory of uniformly loaded cylindrical shell. Mark important internal stress resultants. [07]
- Q.2 (a) Give the classification of shell based on shell curvature with neat sketches. [07]
- Q.2 (b) Derive N_θ and N_ϕ for spherical dome due to self weight and live load uniformly distributed load. [07]
- OR
- Q.2 (b) Explain in short the Levy's Solution and Energy method. [07]
- Q 3 (a) Using membrane theory, derive the condition of equilibrium for doubly curved surfaces. [07]
- Q 3 (b) Develop basic equation of membrane analysis of a paraboloid of revolution. Give stress function Φ , Z & R if $2a = 20m$, $2b = 26m$, rise = 2.8m and thickness = 70 mm.
- OR
- Q 3 (a) Derive the basic fourth order differential equation of plate in polar coordinate. [07]
- Q 3 (b) Explain the difference between thin plate and thick plate. [04]
- Q 3 (c) Enlist all the stress resultants generated in a shell element with proper notations and meaning. [03]
- Q 4 (a) Derive the expression for deflection of a simply supported rectangular plate ($a \times b$) subjected to uniformly distributed load of intensity " q_0 " using Navier solution. Also find the value of maximum deflection for a square thin plate having 3.5 m x 3.5 m size. Take $\mu=0.3$ and $E= 2 \times 10^5 \text{ N/mm}^2$ [07]
- Q 4 (b) Explain Finite difference method of solving rectangular shape plate problem. [07]
- OR
- Q 4 (a) State the equilibrium equation for a plate of constant flexural rigidity ' D ' in polar coordinates. [07]
- Q 4 (b) Explain the superiority of curved elements compared to linear. [07]
- Q 5 (a) Explain different boundary conditions exist in plate theory with neat sketches and necessary equations. [07]
- Q 5 (b) Derive the basic fourth order partial differential equation for a thin isotropic plate. [07]
- OR
- Q 5 (a) Enlist the various advantages and disadvantages of Navier solution and Levi's Solution. [07]
- Q 5 (b) Using Levi's solution obtain the equation of a thin rectangular plate subjected to hydrostatic load having two opposite edges as fixed and two opposite edges as simply supported. Also find the deflection at centre of plate. [07]