

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – III • EXAMINATION – WINTER • 2014****Subject code: 731504****Date: 27-11-2014****Subject Name: Plates and Shells****Time: 02:30 pm - 05:00 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) Explain in short the Levyö Solution and Energy method. **07**
 (b) Derive the expression for the deflection at center for simply supported square plate subjected to hydrostatic pressure. **07**

- Q.2** (a) Explain the boundary conditions of Cantilever plate, simply supported and fixed rectangular plate. **07**
 (b) Derive the value of stresses generated in a conical shell under udl and point load at crown **07**

OR

- (b) Derive the value of stresses generated in a spherical shell under udl and point load at crown. **07**
- Q.3** (a) State, the equilibrium equation for a plate of constant flexural rigidity D in polar coordinates. **07**
 (b) Determine the maximum deflection in a square plate of size of 2.5m and thickness of 70 mm is subjected to a concentrated load 30 kN at the centre. The plate is fixed all around the edges. $E = 200$ GPa. **07**

OR

- Q.3** (a) Determine M_r for simply supported circular plate of radius 4.5 m, having a hole in the centre of radius 1.2 m. Assume $\nu = 0.18$, $q = 60$ N/m². **07**
 (b) Determine the maximum deflection in a circular plate of radius of 1.8m and thickness of 60 mm is subjected to a concentrated load 25 kN at the centre. The plate is fixed all around the edges. $E = 200$ GPa. **07**

- Q.4** (a) A spherical roof dome is subjected to its own weight. Determine the required cross sectional area of the thrust ring. Take $R = 40$ m; $\phi_1 = 60^\circ$ and $h_s = 12$ cm (thickness of the dome). Assume that the dome and the thrust ring are constructed of concrete with $\nu = 0.17$. **07**
 (b) Explain the membrane solution of elliptic hyperboloids. **07**

OR

- Q.4** (a) Explain Finite difference method of solving rectangular shape plate problem. **07**
 (b) Develop basic equation of membrane analysis of a paraboloid of revolution. Give stress function $\bar{u}$, Z & R if $2a = 20$ m, $2b = 26$ m, rise = 2.8m and thickness = 86 mm. **07**

- Q.5** Design a multipurpose hall of size 40mX50m. It is proposed to provide a Hyperbolic shell roof with rise of 3.4m. Use M25 and Fe 415. **14**

OR

- Q.5** Design a tilted inverted umbrella type Hyperbolic shell supported by a central column of diameter 500mm, length 25m, width is 18m. It is tilting along the longer side with height of one end which is 1.2m and other is 3.5m from centre. Use M25 and Fe 415 **14**
