

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. Sem. – III - Examination –June- 2011****Subject code: 731504****Subject Name: Plates and Shells****Date:07/06/2011****Time: 10.30 am – 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) A circular plate of diameter 3.0m and 30mm thickness carries a uniformly distributed load of $q=20\text{kN/m}^2$. Find the maximum deflection and maximum bending stress. Assume plate is fixed all around. Take $E=200\text{Gpa}$ and $\mu=0.3$. **07**
- (b) State the boundary conditions of following plates. **07**
 (1)Cantilever, (2)Square simply supported(all edges), (3) Square fixed plates (all edges),

- Q.2** (a) Distinguish between “membrane theory” and “exact theory” of small deflection of plate. Explain stress resultants in both theories with sketches. **07**
- (b) A simply supported plate 3mX3m and 25 mm thick carries a udl of 20kN/m^2 . Find the maximum deflection, bending stress at a distance of 1.5m from both adjacent sides and reactions at supports. **07**

OR

- (b) Derive the support shear for a rectangular plate of size 3mX5m carrying a point load of 50kN. Assume supports to be fixed. $E=200\text{Gpa}$ and $\mu=0.25$. **07**
- Q.3** (a) Find the value of stresses generated in a conical shell under udl and point load at crown. **07**
- (b) Using membrane theory derives the condition of equilibrium for singly curved surfaces. **07**

OR

- Q.3** (a) Find the value of stresses generated in a spherical shell under udl and point load at crown. **07**
- (b) Using membrane theory derives the condition of equilibrium for doubly curved surfaces. **07**

- Q.4** (a) Give merits and demerits of Navier’s solution and Levy’s solution **04**
- (b) Design a tilted inverted umbrella type Hyperbolic shell supported by a central column of dia.400mm from following data. **10**
 Length is 20m,width is 14m.tilting is along the longer side with height of one end is 1m and other is 3m from centre. Use M20 and Fe 415.

OR

- Q.4** (a) Explain in brief energy method of plate problem. **04**
- (b) Design a multipurpose hall of size 32mX30m.It is proposed to provide a Hyperbolic shell roof with rise of 2.5m.Use M20 and Fe 415. **10**

- Q.5** (a) Explain the superiority of curved elements compared to linear. **04**
- (b) State the assumptions made in the derivation of “plate equation” **03**
- (c) Develop basic equation of membrane analysis of a paraboloid of revolution. Give stress function Φ , Z & R if $2a = 16\text{m}$, $2b = 22\text{m}$, rise = 2.5m and thickness = 80 mm. **07**

OR

- Q.5** (a) Explain “Finite difference method “of solving rectangular shape plate problem. **04**
- (b) Write only an expression of maximum deflection and maximum moment in an elliptical plate subjected to uniform pressure 'q'. **03**
(Plate is fixed all around)
- (c) A spherical roof dome is subjected to its own weight. Determine the required cross-sectional area of the thrust ring. Take $R = 35\text{m}$; $\phi_1 = 55^\circ$ and $h_s = 10\text{ cm}$ (thickness of the dome). Assume that the dome and the thrust ring are constructed of concrete with $\nu = 0.15$. **07**
