DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD – 402103
Summer Semester Examination:– May-2018

Branch: M.Tech. (Structural Engineering) **Semester:II**

Subject with Subject Code: - Theory of Plates and Shells code (CVSE201)

Date: - 14/05/2018 **Marks: 60** **Time: 3 Hrs.**

==========

Instructions to the Students

1. Each question carries 20 marks.
2. Attempt any three questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q1.a) What are the assumptions made in thin plates with small deflections? Give a brief account of classification of plates. **(10 Marks)**

Q1.b) Derive the moment curvature relationship in the case of pure bending of plates. **(10 Marks)**

OR

Q1.c) Derive the equations of equilibrium for small deflections of laterally loaded plates. **(10 Marks)**

Q1.d) A long narrow simply supported rectangular plate 1m wide, 10mm thick subjected to a uniform load of 1.0N/M^2.Taking poisons ratio=0.3, and E=200Gpa. Find maximum deflection and B.M. **(10 Marks)**

Q2.a) A simply supported rectangular plate of dimension a x b x h is subjected to load 'P acting over an area XY. Derive the expression for deflection. Adopt Navier's approach. **(10 Marks)**

Q2.b) Find Levy's solution for simply supported and uniformly loaded rectangular plates. **(10 Marks)**

Q3.a.1) Derive the differential equation for deflection for the symmetrical bending of a circular plate with lateral loads of the type. **(15 Marks)**

$$\frac{d^3w}{dr^3}+\frac{1}{r}\frac{d^2w}{dr^2}-\frac{1}{r^2}\frac{dw}{dr}=\frac{Q}{D}$$

Q3.a.2) Give the difference between the circular plate with and without hole with respect to analysis and design. **(05 Marks)**

OR

Q3.b) Find the transverse deflection w, radial moment Mr, tangential moment M_Q and corresponding stresses and also find the Wmax for the circular plates of the following types.

i) A simply supported plate subjected to UDL q

ii) A simple supported plate subjected to point load a Centre **(20 Marks)**

Q4.a) Derive the equations of equilibrium of membrane theory for cylindrical shells. **(10 Marks)**

Q4.b) A simply supported circular cylindrical shell with free longitudinal edges is spanning 22m and radius of 10m and semi-circular angle of 35 degrees. The edge beam has width of 300mm and depth of 1500mm. Determine stress resultants for N_x N_0 Nx_0 under self-weight using membrane theory. If there is an edge beam what is the maximum longitudinal force developed in the edge beam. **(10 Marks)**

OR

Q4.c) Write boundary conditions for simply supported cylindrical shells with the edge Conditions.

i) Single shell without edge beam ii) Single shell with edge beam **(08 Marks)**

Q4.d) State the assumptions in Schorer's theory of cylindrical shells and drive the shorer's differential equation **(12 Marks)**

Q5.a) Derive the membrane differential equation for the elliptic paraboloid. **(10 Marks)**

Q5.b) Obtain expression for transverse deflection using Finster Walder theory. **(10 Marks)**

OR

Q5.c) State the assumptions made in Finster Walder theory. **(05 Marks)**

Q5.d) Obtain the expression for deflection in case of uniformly loaded circular plates with clamped edges. **(15 Marks)**

Q6.a) 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/m² 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 300 mm by 1500 mm. Shell may be divided into four parts for arch action. Use M20 and Fe250 steel. Show the design details clearly. **(10 Marks)**

Q6.b) Discuss the general guidelines followed for selecting the dimensions of the various structural components of a shell. **(10 Marks)**
