Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME – SEMESTER II (OLD) EXAMINATION – SUMMER 2017

Subject code: 1722002 **Date:10/05/2017**
Subject Name: Advanced Concrete Structures
Time: 10:30 A.M. to 01:00 P.M. **Total Marks: 70**
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Assume concrete grade M20 & Fe 415 steel grade unless otherwise mentioned.**
5. **Use of IS 456, SP 16, IS 875, IS 3370 & IS 1893 are permitted.**

Q.1 Determine the design wind pressure acting on a building having 25 m x 35 m plan dimensions with columns spaced at 5 m c/c in both directions. The height of building is 35 m and is situated in Surat in developed out-skirt area with scattered buildings of its height. Also draw the pressure diagram. **14**

Q.2 (a) Define the terms: (1) Seismic weight, (2) Accidental eccentricity, (3) Centre of stiffness, (4) Centre of mass, (5) Response reduction factor, (6) Time period of building and (7) Base shear. **07**

(b) Calculate the maximum safe working live load on a coffered floor system using IS 456 method with following details. **07**

- Over all dimensions of the hall 12 m x 12 m
- Size of Beam is 150 mm x 750 mm, excluding slab,
- Spacing of beam is 2 m centre to centre along both directions.
- All beams have bottom bars 4-20mm and top bars 2-20 mm dia.
- Slab thickness 110 mm and floor finish 1 kN/m^2.

OR

(b) Design the bottom ring beam of a spherical dome, without opening, having 15 m span, 3 m central rise and 120 mm thickness. The floor finish load is 1 kN/ m^2 and no live load. Assume width of the ring beam is 300 mm and it is supported throughout with masonry wall. **07**

Q.3 Design a combined footing for columns C_1-C_2-C_3 spaced 4m c/c. The characteristic load on C_1, C_2 and C_3 are 1000 kN, 1200 kN and 1000 kN, respectively. Width of footing is restricted to 1.5 m. The columns are 300 mm x 300 mm each. The materials are M25 concrete and Fe 415 steel. The safe bearing capacity of soil is 300 kN/m^2. **14**

OR

Q.3 A grid floor system is provided for hall of overall dimensions 7.5 m x 12 m forming slab panels of size 2.5m x 3m. Assume all 7.5 m long beams of size 230 mm x 600 mm (excluding slab) and all 12 m long beams of size 230 x 700 mm (excluding slab) provided as per slab panels. Design the most critical 7.5 m long beam using approximate method, if slab thickness is 110 mm, floor finish is 1 kN/m^2. Live load is 4 kN/m^2 **14**

Q.4 For a flat slab with drop and column heads, the centre to centre dimension of a typical slab panel is 6m x 6m. The story height is 3.2 m, live load is 4 kN/m^2. Design an interior panel of the slab using M20 **14**

concrete and Fe415 steel. The size of column is 400 mm x 400 mm. Do not check the flat slab for shear. Sketch reinforcement details.

OR

Q.4	**(a)**	Design reinforcement in a folded plat roof having all plates making an angle of 45^0 with horizontal and casted so that vertical depth is 800 mm. The thickness and simply supported span of the plate is 110 mm 8 m, respectively. Consider live load of 4 kN/m^2.	**07**
	(b)	Design the reinforcement in supporting shaft of an Intze water tank having 2.2 m internal diameter and 150 mm thickness. The shaft carries an axial load of 4500 kN and bending moment of 650 kN-m at service condition for dead and wind load combination.	**07**
Q.5		A raft foundation of total size 19 m x 11 m including a projection of 0.5 m along all four sides beyond the centre of columns. It supports columns at 6 m spacing along length (19 m) and 5 m spacing along breadth (11 m). Each peripheral and interior column carries a factored load of 700 kN and 1400 kN, respectively. Net bearing capacity of soil is 100 kN/m^2. The column size is 300 mm x 300 mm. Use M20 concrete and Fe 415 steel. Design the raft foundation.	**14**

OR

Q.5	A pile cap is to be design for a group of 4 friction piles each of 400 mm diameter to transfer of loads from a column of section 500 mm x 500 mm carrying an axial load of 2000 kN and a uniform moment of 200 kN-m at service state to the soil. Design the pile cap using M20 concrete and Fe415 steel.	**14**

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