

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014****Subject code: 1722002****Date: 18-06-2014****Subject Name: Advanced Concrete Structures****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
4. Use of IS 875 part III, IS 456, IS 1893, IS13920, SP 16, IS 3370 are permitted
5. Use M20 grade of concrete and Fe 415 steel if not given anywhere
6. Draw neat sketch if required
7. Unit weight of RCC = 25 kN/m^3 and Masonry = 20 kN/m^3

Q.1 (a) A circular water tank has outer cylindrical wall 12m diameter, 5m high, supporting shaft 3m diameter. Design the top dome and top ring beam. Use M25 concrete grade. **14**

Q.2 (a) A folded plate floor has all plates making an angle of 50 degrees with horizontal and casted so that vertical depth of folded plate is 1.5m. Design reinforcement in plate to carry L.L = 2.5 kN/m^2 . Assume plate thickness 130 mm and simply supported span of 20m. Use M20 grade of concrete and Fe 415 steel. **07**

(b) Design a circular water tank rested on Ground having 11.5m internal diameter and 4.2m high fixed at base and free at top. Use M20 grade of concrete and Fe 415 steel. **07**

OR

(b) A column of size 400 x 400 mm carrying $P_u = 1500 \text{ kN}$, $M_{ux} = 200 \text{ kNm}$, $M_{uy} = 60 \text{ kNm}$ is supported by a pile cap 900 mm effective thickness resting on 4 piles (of 450 mm Diameter each) at 1500 mm c/c. Design the reinforcement in pile cap and calculate maximum pile load. **07**

Q.3 A Grid Floor has slab thickness of 120 mm which carries L.L = 4 kN/m^2 and F.F = 1.0 kN/m^2 , is provided for a hall of 18 meter x 18 meter with wall on outer periphery and 5 beams of 18 meter span in either direction to form slab panel of 3 m x 3 m. Consider size of beam as 300 mm x 1300 mm (including slab depth). Calculate the bending moment, torsional moment and shear force at a beam junction at nearest corner center of hall, also design reinforcement in central beam of 18 meter span for reinforcement. Use M20 concrete and Fe 415 steel. Use any method. **14**

OR

Q.3 A flat slab 200 mm thick with floor finish 1 kN/m^2 , live load 4 kN/m^2 is supported at 5 m x 5 m c/c by columns of size 450 mm diameter. Check the slab for shear and design reinforcement, and sketch the reinforcement. No need to check for pattern loading. Use direct design method. **14**

Q.4 A building of size 16 m x 25 m has 30 columns spaced at 4 m X 5 m c/c and has 4 stories of 4 m each. Calculate wind load on interior frame along 25 m length of the building when the wind blows along that direction, and calculate the bending moment in any interior column at ground floor due to the said wind load. Assume the building to be located at Vadodara using IS 875. **14**

OR

- Q.4 (a)** Design a conical roof over a 10 meter diameter hall with a rise of 2 meter. Assume L.L=1.5 kN/m². The dome is supported on 450 mm wide continuous support on periphery. **07**
- (b)** A spherical dome having a span of 12 m central rise of 2.5 m has no opening and has thickness of 180 mm, floor finish 1 kN/m² and live load 2 kN/m². Design bottom ring beam of 350 mm width and supported through out with masonry wall. **07**
- Q.5** A building of size 16 m x 18 meter has 20 columns of size 350 mm x 475 mm, spaced at 4m x 6 m c/c in both direction. Assume 230 mm thick brick masonry wall on periphery only and no internal walls. Consider 1.5 meter x 1.2 meter window opening in each panel and in each storey on periphery only. The building has 5 stories of 3 m each. The height of parapet wall is 1.0 m. The plinth level of RCC slab and beam is at 0.9 m above G.L and footing is provided at 1.5 m below G.L. Consider beam size 230 mm x 500 mm in both direction and slab thickness 125 mm. Consider L.L = 4 kN/m² and F.F = 1.0 kN/m². The building is located in Zone IV. calculate Earthquake forces on any one internal frame using IS 1893. **14**
- OR**
- Q.5** A combined footing is provided for 3 columns C_A ó 2.4 m c/c - C_B ó 2.2 m c/c - C_C. Assume C_A = 300 X 500 mm (along length), C_B = 450 mm diameter, C_C = 650 X 300 mm (along length), Pu_A = 2450 kN, Pu_B = 2000 kN, Pu_C = 2600 kN. Calculate the length, analyze and design the footing beam if the minimum projection of the beam beyond column center is 900 mm, footing width is 3.50 meter and SBC of soil is 180 kN/m². **14**
