

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME Semester –II Examination Dec. - 2011**

**Subject code: 1722002****Date: 12/12/2011****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. Assume concrete grader M20 & Fe 415 steel grade unless otherwise mentioned.
5. Use of IS-456, SP-16, IS-875 & IS 1893 permitted in the examination hall.

**Q.1 (a)** A spherical dome having a span of 15m central rise of 3m has no opening and has thickness of 170mm, floor finish  $1 \text{ kN/m}^2$ , no live load. Design bottom ring beam of 350mm width and supported through out with masonry wall. **07**

**(b)** The supporting shaft an Intze water tank is 2400mm internal diameter and 200 mm thick. Design the reinforcement in the shaft for combination of working axial load of 6000 kN & working bending moment 900 kNm for dead & wind load combination. **07**

**Q.2 (a)** Explain the following terms in earthquake engineering **07**  
1) Ductile Detailing of beams  
2) Response reduction factor  
3) Time period of building

**(b)** A folded plate floor has all plates making an angle of 45 degrees with horizontal and casted so that vertical depth of folded plate is 900mm. Design reinforcement in plate to carry live load  $3 \text{ kN/m}^2$  if the plate thickness is 100 mm & simply supported span of 10m. **07**

**OR**

**(b)** A Coffered floor system is provided for hall width of overall dimensions  $12\text{m} \times 12\text{m}$  and provided by rib beams of size  $200 \times 900\text{mm}$  (excluding slab) provided at 2m c/c along both directions. If all beams have bottom bars 2 nos-25mm, top bars 2 nos-16mm and slab thickness of 100mm, floor finish of  $1 \text{ kN/m}^2$ . Calculate the maximum safe working live load on slab. Use IS-456 method. **07**

**Q.3** A raft foundation of total size  $15\text{m} \times 17\text{m}$  is provided for 9 columns with 6m c/c along one direction & 7m c/c along other direction and 1.5m projection of slab on all sides. Assume working load on interior column 6000kN & on all other columns 2500kN. Analyse the periphery beam 17m long. **14**

**OR**

**Q.3** A column of size  $450 \times 600 \text{ mm}$  carrying  $P_u = 2500 \text{ kN}$ ,  $M_{ux} = 350 \text{ kNm}$ ,  $M_{uy} = 80 \text{ kNm}$  is supported by a pile cap 1200 mm thick resting on 4 piles (of 600 mm Diameter each) at 1800 mm c/c. Design the reinforcement in pile cap and calculate maximum pile load. **14**

- Q.4** A building of size 20m x 18m has 20 columns spaced at 5m (4 bays) X 6m (3 bays) c/c and has 4 stories of 4m each. It has windows of size 1.8m x 1.35m in each floor in each panel & each storey on outer periphery. Calculate wind load on interior frame along 18m length of the building when the wind blows along 18m length. Also calculate the maximum bending moment in an interior column in said frame. Assume the building to be located at sea shore in Mumbai. **14**

**OR**

- Q.4** A Grid floor system is provided for hall with overall dimensions 12 m (4m x 3nos) X 15 m (3m x 5nos), forming slab panels of size 3m x 4m. Assume all 12m long beams of size 230 x 900 mm (excluding slab) and all 15m long beams of size 230 x 800 mm (excluding slab), provided as per slab panels. Design the most critical 12m long beam using approximate method, if slab thickness is 100 mm, floor finish is 1 kN/m<sup>2</sup>. Live load is 4 kN/m<sup>2</sup>. **14**
- Q.5** Proportionate a combined footing for three columns  $C_A - 2000 \text{ mm} - C_B - 1800 \text{ mm} - C_C$ , if  $C_A = 230 \times 600 \text{ mm}$ ,  $C_B = 400 \text{ mm}$  diameter,  $C_C = 750 \times 230 \text{ mm}$ , Assume factored axial loads for columns A, B, C as 1200kN, 1500kN, 2300kN respectively, and Safe Bearing Capacity of Soil as 180 kN/m<sup>2</sup>. Also design the footing beam of size 900 mm x 1200 mm. **14**

**OR**

- Q.5** A flat slab 150 mm thick with floor finish 1 kN/m<sup>2</sup>, live load 4 kN/m<sup>2</sup> is supported at 4.5 m X 5.5 m c/c by columns of size 300 mm diameter. The column heads are 700 mm depth below slab and size ranging from 1600 mm diameter at top to 500 mm diameter at bottom, no slab drops provided. Check the slab for shear and design reinforcement in middle strip along short span, and sketch the reinforcement. **14**

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