

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 722002

Subject Name: Advanced Concrete Structures

Date: 06 /07 /2010

Time: 11.00am – 1.30pm

Total Marks: 60

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary & mention same.
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 1893 permitted in the examination hall.

Q.1 (a) A flat slab 175mm thick with floor finish 1 kN/m², live load 4 kN/m² is supported at 4.5mX5.5m C/C by columns of size 450x750mm with longer dimension along the long span, and no column heads or slab for drops provided. Check the slab for deflection and design reinforcement in middle strip along long span. **06**

(b) A combined footing of size 2400mmx6800mm is provided for columns as shown in fig.1 Assume C_A =230x600 mm, C_B =400mm diameter, C_C =230x750 mm, P_{uA} = 1200kN, P_{uB} = 1500kN, P_{uC} = 1700kN **06**

Analyze the footing beam for bending moment, shear force and torsional moment.

Q.2 (a) A spherical dome having a span of 20m central rise of 4m has no opening and has thickness of 170mm, floor finish 1 kN/m², live load 2 kN/m². Design bottom ring beam of 230mm width and supported through out with masonry wall. Also calculate the stresses in dome at mid height. **06**

(b) A flat slab 150mm thick, floor finish 1 kN/m², live load 5 kN/m² is supported at 5m x 6m c/c, by circular columns of 450 mm diameter and column heads with bottom face at 45 degrees with horizontal. Calculate the depth of column head required as per **06**

a) Shear force criteria

b) Deflection criteria, assuming bottom bars as 10mm at 120mm c/c.

OR

(b) A folded plate floor has all plates making an angle of 60 degrees with horizontal and casted so that vertical depth of folded plate is 1200mm. Design reinforcement in plate to carry live load 2 kN/m² if the plate thickness is 120 mm & simply supported span of 15m. **06**

Q.3 (a) A raft foundation of total size 12mX16m is provided for 9 columns with 5m c/c along one direction & 7m c/c along other direction and 1m projection of slab on all sides. Assume working load on interior column 4000kN & on all other columns 2000kN. Analyse the interior beam 16m long. **06**

(b) A building of size 12mx15m has 16 columns spaced at 4mX5m c/c and has 5 stories of 3.6m each. It has windows of size 2.4m x 1.2m in each floor in each panel & each storey on outer periphery. Calculate wind load on interior frame along length of the building when the wind blows along the length. Assume the building to be located at CG road Ahmedabad. **06**

OR

- Q.3 (a)** A column of size 600x600mm carrying $P_u = 2000\text{kN}$, $M_{ux} = 210\text{kNm}$, $M_{uy} = 80\text{kNm}$ is supported by a pile cap 1000mm thick resting on 4 piles (of 300mm Diameter each) at 1500mm c/c. Design the reinforcement in piles cap and check the cap shear. Also calculate maximum pile load. **06**
- (b)** A spherical dome has span of 16m & central rise of 3m with an opening of 3m horizontal diameter. Assume slab 100mm thick, floor finish 2 kN/m^2 & no live load & lantern load of 250kN and design top ring beam of size 200x300mm near opening. **06**

- Q.4 (a)** A grid floor has slab 100mm thick, floor finish $= 1\text{ kN/m}^2$, live load 3 kN/m^2 is provided for a hall with overall dimensions of 15m x 16m c/c with wall on outer periphery only and 3 beams -15m long and 4 beams -16m long so as to form slab panels of size 3mx4m. Assume all beams of size 300x1300mm (total depth) and design reinforcement in central beam 15m long. **06**
- (b)** A circular water tank with flexible base, 12m diameter and 8m height is provided at ground level. Calculate the thickness of cylindrical wall required & design the wall at bottom and mid height. Assume concrete grade M25,.. **06**

OR

- Q.4 (a)** For the grid floor as in Q-4(a), Calculate the bending moment, torsional moment and shear force at a beam junction at nearest from center of hall use *Rankine Grashoff* method. **06**
- (b)** An overhead water tank of 6m diameter in plan & container height 5m is supported by 6 columns of size 400mm diameter at outer periphery. The bottom container is 20m above ground and braces of sizes 300x300 provided at 4m interval. **06**

Assume tank located on sea shore in Jamnagar and design column braces (neglect self weight)

- Q.5 (a)** A beam of size 300x450mm with top bars 4nos -20mm Diameter, bottom bars 4nos -16mm Diameter & suitable stirrups is provided for beam whose plan is shown in figure -2 with a concentrated vertical working load P at free end C. Neglect the self weight of beam and calculate the safe value of P **06**
- (b)** The supporting shaft of an Intze water tank is 3000mm internal diameter and 200mm thick. Design the reinforcement in the shaft for combination of working axial load of 8000 kN & working bending moment 1200 kNm for dead & wind load combination. **06**

OR

- Q.5 (a)** Explain the following term in earthquake engineering **06**
- 1) Seismic weight
 - 2) Response reduction factor
 - 3) Time period of building
 - 4) Base shear
 - 5) Accidental eccentricity
 - 6) Centre of stiffness
- (b)** A Coffered floor system is provided for hall width of overall dimensions 10mx12m and provided by rib beams of size 300 x 500mm (excluding slab) provided at 2m c/c along both directions. If all beams have bottom bars 2 nos-32mm, top bars 2 nos-20mm and slab thickness of 100mm, floor finish of 1 kN/m^2 . Calculate the maximum safe working live load on slab. Use IS-456 method. **06**

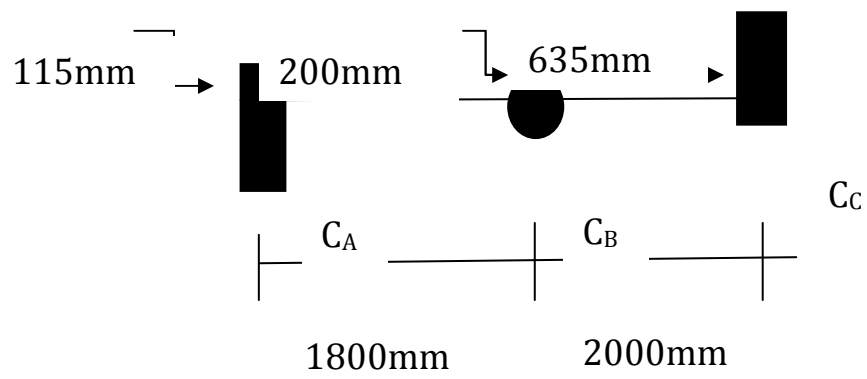


Fig -1 Que- 1(b)

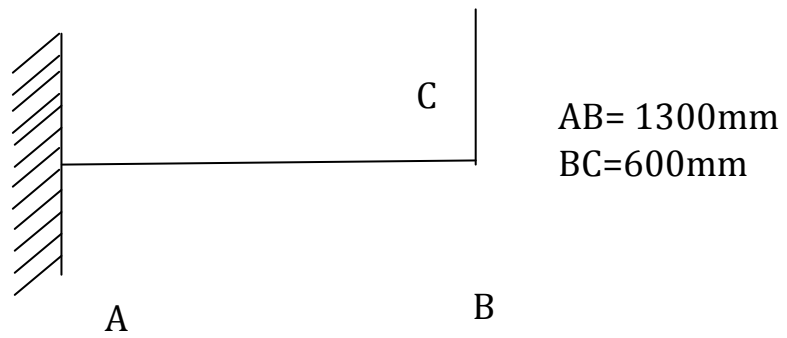


Fig -2 Que- 5 (a)