**CE2401- DESIGN OF REINFORCED CONCRETE AND BRICK MASONRY STRUCTURES**

Unit-I Retaining wall

**PART-A**

1. List out the various forces acting on a cantilever retaining wall.
2. Write down the equation for co-efficient of Passive Earth Pressure.
3. Name the two important stability aspects of a retaining wall.
4. Why counterforts are provided in a counterfort retaining wall?
5. How the vertical stem of a counterfort retaining wall is designed?
6. What are the reuirements to be satisfied for stability of retaining wall?
7. Why is shear key provided in Retaining wall?
8. Draw the deflected shape of the Cantilever Retaining wall?
9. What are the types of Retaining wall?
10. A cantilever retaining wall supports an inclined backfill. Sketch the distribution of active earth pressure on the stem.

**PART-B**

1. Design the main bars of 16mm diameter and the distribution bars of 8mm diameter required at the bottom section of the stem of a cantilever retaining wall to retain a horizontal backfill level with its top for the following data.

Height of the stem=4.5m

 Thickness of stem at top and bottom:200mm and 450mm respectively.

 Density of soil is 18kN/m3 and angle of repose is 30o

 Materials used in the construction are M25 grade of concrete and Fe415 steel reinforcement.

2. Design a R.C.C. Cantilever retaining wall to retain the leveled earth embankment 5m high above the ground level. The unit weight of earth is 17KN/ m3 and its angle of is 300 . the safe bearing capacity of the soil is 200KN/m2 . The coefficient of friction between soil and concrete is 0.55. Use M20 grade of concrete and steel grade Fe415.

 3. What are the design principles involved in the different components of Counterfort Retaining Wall?Write down the steps involved in the design of Counterfort Retaining Wall.?

4. Design the main bars of 12mm diameter and the distribution bars of 8mm diameter required at the bottom section of the stem of a counter fort retaining wall to suit the following data.

Nature of backfill: Horizontal

Height of the stem=6.5m

Thickness of stem at top and bottom:250mm and 450mm respectively.

 Density of soil is 18kN/m3 and angle of repose is 30o

Centre to centre spacing of counter forts=3m.

Materials used in the construction are M25 grade of concrete and Fe415 steel reinforcement.

5. Design a ‘T’ shaped cantilever retaining wall to retain earth 3m high above ground level. The unit weight of earth is 20kN/m3, and its angle of repose is 33o. the embankment is horizontal at its top. The safe bearing capacity of soil is 120kN/m2 and the coefficient of friction between soil and concrete as 0.50.

6. What are the circumstances under which counter fort retaining walls are preferred? Explain the various steps involved in the design of different components of a counter fort retaining wall.

7. What are types retaining wall and explain? Explain the methods of designing a shear Key in a Retaining wall?

8. Design the stem of a cantilever retaining wall to retain earth 3.5m high above ground level. The unit weight of earth is 18kN/m3, and its angle of repose is 30o. the embankment is horizontal at its top. The safe bearing capacity of soil is 200kN/m2 and the coefficient of friction between soil and concrete as 0.5.

9.Design the vertical stem of a counter fort retaining wall if the height of the wall above the ground level is 5.5m. SBC of the soil=180kN/m2  . Angle of internal friction = 30o. Unit weight of back fill=18kN/m3. spacing of counter forts=3m. coefficient of friction between soil and concrete as 0.5.

 10. Design the base slab of a counter fort retaining wall if the height of the wall above the ground level is 5.5m. SBC of the soil=180kN/m2 . Angle of internal friction = 30o. Unit weight of back fill=18kN/m3. Spacing of counter forts=3m. Coefficient of friction between soil and concrete as 0.5.

Unit-II Water tanks

**PART-A**

1. What is the purpose of providing sliding joint in a water tank?
2. List out the boundary conditions for wall with hinged base and free top.
3. How are the water tanks are classified?
4. For what conditions the underground tanks are designed and checked?
5. Sketch the variation of hoop stress between the crown and base of a hemispherical top cover dome carrying uniformly distributed load per unit surface area.
6. Mention various critical load combination that are to be considered in the analysis of walls of an underground rectangular water tank, when there is a possibility of ground water table to rise above the base slab.
7. Why cover domes for a circular water tank is economical than a flat cover slab?
8. Why bracings are provided in the staging’s of a water tank?
9. Why are bracings provided in the over head water tank?
10. How do you decide the rise of a dome in a water tank?

**PART-B**

1. A circular water tank open at top and resting on a rigid soil has inner diameter 3m and height 3m. Base joint between wall and base slab shall be assumed as hinged . Using M20 concrete and Fe415 steel. Design the wall.
2. A square elevated water tank 3mX 3mX3m height is open at top. Base of the wall may be assumed as hinged. Using M20 concrete and Fe415 steel. Design the wall along the horizontal direction.
3. Design a spherical dome for a circular water tank of diameter 10m. Assume the rise of the dome as 2m. Using M25 concrete and Fe415 steel.
4. Design the short wall of a underground tank of size 10m x 4m x 3.5m deep. Draw the neat sketch to show the reinforcement details.
5. Design an underground water tank of size 3m x8m x3m for the following data. Tvpe of soil: Submerged sandy soil with density=16kN/m2. And angle of internal friction =30o. The water table can rise upto ground level. Design the side walls of the tank.
6. Design a flat bottom circular elevated water tank of diameter 10m and total height 4m which is to be supported by a ring beam of 7.5m diameter. The ring beam is to be supported by six columns equally spaced. Design (i) Dome, (ii) Top ring beam and (iii) Cylindrical wall.
7. Design a circular water tank with free base. Capacity of tank is 5,00,000 liters. Depth of water tank is 4m and free board is 200mm. Using M20 concrete and Fe415 steel
8. Design a circular water tank with fixed base. Capacity of tank is 4,00,000 liters. Depth of water tank is 4.5m and free board is 150mm. Using M20 concrete and Fe415 steel
9. A rectangular RCC water tank with an open top is required to store 80,000 liters of water. The inside dimensions of the tank may be taken as 6m by 4m. the tank rests on walls on the four sides. Design the side wall of the tank. Using M20 concrete and Fe415 steel.
10. A rectangular RCC water tank with an open top is required to store 70,000 liters of water. The inside dimensions of the tank may be taken as 6m by 2.5m. the tank rests on walls on the four sides. Design the side wall of the tank. Using M20 concrete and Fe415 steel.