

Time: 3 Hours

Marks: 80

- Note** 1. Attempt any 4 out of six questions
 2. Question 1 is compulsory
 3. Assume any suitable data where ever required

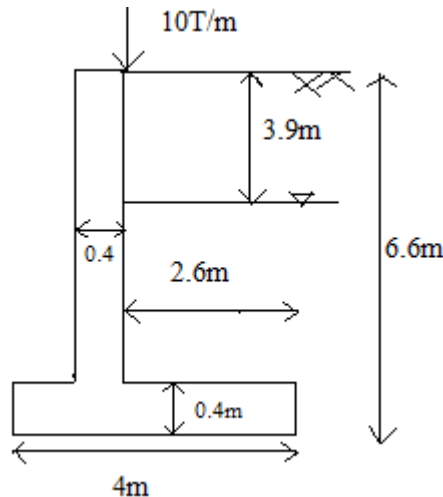
Q.1 Attempt any four

- Explain different types of slope failures with its reason of failure. 05
- Derive the expression for Rankine's Active earth pressure for cohesive back fill 05
- A square group of 16 piles penetrate through the filled up soil of 3 m depth. The pile diameter is 250 mm and pile spacing is 0.75m. The unit cohesion of material is 18kN/m^2 and unit weight of soil is 15kN/m^3 compute negative skin friction given adhesion coefficient as 0.4 05
- Show the calculation of water table correction factors for shallow footing when water table rises to ground surface. 05
- Write a short notes on imperfect ditch conduit 05

- Q.2 a. A cut has to be made 14m deep, inclined at an angle 45° to the horizontal. The possible slip surface has a radius equal to 22m, and passing through the toe of cut slope and trough the point 3.6m away on the top ground from the edge of cut. The C.G of failure mass is 10.3m from the centre of failure circle. The properties of soil are $C=50\text{ kN/m}^2$, $\phi=15^\circ$ has $\gamma=18\text{ kN/m}^3$. Find the factor of safety that would be available in slip surface. Use friction circle method 10
- b. Describe briefly Culmann's graphical method for determining total active earth pressure also draw the change in Culmann's curve when there is a line load acting on backfill 06
- c. A 30kN drop hammer was used to drive a R.C pile. It has free fall of 2.0 m. The average penetration recorded in the last few blows is 6mm/blow. Estimate the allowable load on pile according to Engineering news formula 04

- Q.3 a. A Retaining wall 6m height retains sand with $\phi=30^\circ$ and unit weight of 24 kN/m^3 up to a depth of 3m from top. From 3 to 6m the material is cohesive soil with $C=10\text{ kN/m}^2$, $\phi=10^\circ$ $\gamma_{\text{sat}}=20\text{ kN/m}^3$. The water table is at 3m below ground level. And uniform surcharge of 10kN/m^2 acts on the top of soil. Draw the active earth pressure diagram detailing the values at the critical points. Also calculate the resultant thrust on the wall 10
- b. Derive the equation for critical depth in cohesive soil for infinite slopes under dry, submerged and steady seepage condition 05
- c. Explain the types of conduits with neat diagrams 05

- Q.4 a. Details of a cantilever retaining wall are shown in figure. Calculate the maximum and minimum pressures under the base if the water table rises behind the wall to the level 3.9m from the top of wall. The shear parameters of soil are $C=0$, $\phi=38^\circ$, $\gamma_{\text{sat}}=20 \text{ kN/m}^3$. unit weight of concrete is 24 kN/m^3 if wall friction is taken as 25° on the base of wall, check the stability of all for all conditions 10



- b. Find the forces in 4 struts located at depths 2 m, 5 m, 8 m and 10 m from the top of the cut for a bracing system provided to support an open cut of 10 m depth in a clayey soil. the properties of soil are $\gamma=19 \text{ kN/m}^3$, $C=22 \text{ kN/m}^2$ the centre to center spacing along the length of the cut is 2.8 m. 10
- Q.5 a. Calculate the ultimate bearing capacity of a rectangular footing $1.8 \text{ m} \times 3.6 \text{ m}$ in plan founded at a depth of 1.6 m below ground level. The unit weight of soil is 18 kN/m^3 and effective shear parameters are $C=15 \text{ kN/m}^2$, $\phi=30^\circ$. the natural water table is at a depth of 2 m below ground level. Use IS method given for $\phi=30^\circ$, $N_c=30.1$, $N_q=18.4$, $N_\gamma=22.4$ 10
- b. Describe pile load test for calculating allowable load of single pile as IS 2911 Part 4. 05
- c. Explain the mechanism of reinforced earth wall system 05
- Q.6 a. A pile group of 25 piles has to be proportioned in a uniform pattern in soft clay with equal spacing in all directions. Assuming the value of cohesion is to be constant throughout the depth of piles, determine the optimum value of spacing of the piles in the group. Assuming adhesion factor 0.7. Neglect the end bearing effect given the diameter of pile as 0.5 m. Also calculate the efficiency of group using converse Labarre formula. 10
- b. List out the assumptions made by Terzaghi for his bearing capacity theory. 05
- c. Explain the advantages of reinforced soils. 05