

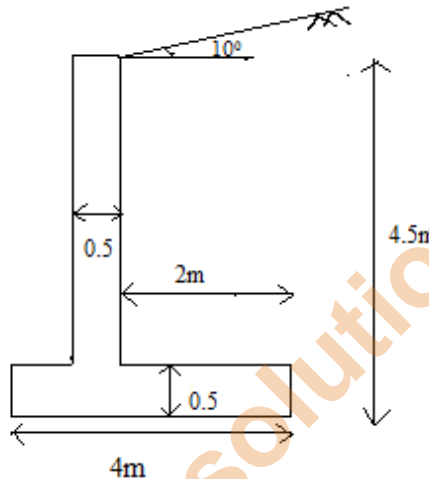
(3 Hours)

Max 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
- In a laboratory consolidation test, the void ratio of samples reduced from 0.85 to 0.73 as the pressure was increased from 1 to 2 kg/cm<sup>2</sup>. If the permeability of soil be  $3.3 \times 10^{-4}$  cm/s find (i) coefficient of volume change (ii) coefficient of consolidation **05**
  - Derive the relation between principal stresses at failure in soil mass on the basis of Mohr-coulomb criteria of failure **05**
  - Derive the expression for factor of safety in infinite slopes for dry, submerged and steady seepage condition for Cohesionless soil **05**
  - A 6m high vertical wall supports a saturated cohesive backfill ( $\phi=0$ ) with horizontal surface. The top 3m of backfill weights 18 kN/m<sup>3</sup> and has apparent cohesion 18 kN/m<sup>2</sup>. And the density and cohesion for bottom 3m of the backfill 20 kN/m<sup>3</sup> and 24 kN/m<sup>2</sup> respectively. Draw the pressure distribution diagram before formation of tension crack **05**
  - Explain the assumptions and failure zones described by Terzaghi for shallow foundations **05**
  - A 12m long and 300mm diameter concrete pile is driven in a uniform deposit of sand  $\gamma_d=18$  kN/m<sup>3</sup>  $N_q=137$ . calculate the load capacity of pile assume critical depth as 15 times the diameter of pile given  $k_s=2.0$  **05**
- Q.2
- A 2m thick layer of saturated clay lies in between two permeable layers. The clay has the following properties  $w_L=45\%$  coefficient of permeability  $2.8 \times 10^{-7}$  cm/s, initial void ratio is 1.25 and initial effective over burden pressure at the middle of clay layer 2 kg/cm<sup>2</sup> and is likely increase to 4 kg/cm<sup>2</sup> due to construction of new building Determine (1) final void ratio of clay (2) settlement of proposed building (3) time required for 50% consolidation **10**
  - Explain the shear strength characteristics of sands in respect to stress-strain and volumetric changes. **05**
  - Briefly explain UU Strength for fully and partially saturated soils **05**
- Q.3
- An unconfined compression test was performed on a undisturbed sample of normally consolidated clay, having a diameter of 3.75cm and 7.5cm height. Failure occurs under a vertical compressive load of 116.3kg. The axial deformation recorded at failure was 0.9cm. A remolded sample of same soil failed under a vertical compressive load of 68.2kg and corresponding axial deformation was 1.15cm. Find unconfined compressive strength and cohesion of soil in undisturbed and remolded state. Also determine sensitivity of soil and classify accordingly **10**
  - Define (a) Coefficient of compressibility (b) Degree of consolidation (c) Compression index (d) Coefficient of consolidation (e) Over consolidation ratio **05**
  - Mention any two causes of preconsolidation of soil and describe the graphical method for finding preconsolidation pressure. **05**

- Q.4 a. A cut has to be made 6.5m deep, inclined at an angle  $35^\circ$  to the horizontal. The possible slip surface has a radius equal to 13.5m, and passing through the toe of cut slope and through the point 3 m away on the top ground from the edge of cut. The C.G of failure mass is 6m from the centre of failure circle. The properties of soil are  $C=30 \text{ kN/m}^2$ ,  $\phi=15^\circ$  has  $\gamma=2.0 \text{ t/m}^3$ . Find the factor of safety that would be available in slip surface. Use friction circle method **10**
- b. What is group capacity of piles and mention how the allowable load is found from pile load test for single and group piles **05**
- c. Derive the expression for Rankine's active earth pressure for Cohesionless backfill **05**
- Q.5 a. Check the stability of Concrete retaining wall with Cohesionless backfill having  $\gamma=18 \text{ kN/m}^3$   $\phi=38^\circ$  and wall friction  $25^\circ$  **10**



- b. Explain the limitations of plate load test **05**
- c. Derive the expression for Taylor's stability number and explain the uses of it **05**
- Q.6 a. A rectangular footing 4m wide and 6m long transmits the load of column at a depth of 1.5m. calculate the safe load which the footing can carry using Vesic's method given  $C=20 \text{ kN/m}^2$   $\phi=30^\circ$   $\gamma=18 \text{ kN/m}^3$   $N_c=30.1$ ,  $N_q=18.38$ ,  $N_\gamma=15.64$  **10**
- b. A square group of friction piles 16 in number each of 0.5m diameter are installed @ 1.5m center to center in a uniform clay stratum of 16m deep. The depth of piles extends to 12m below surface. The average unconfined compressive strength of clay is  $80 \text{ kN/m}^2$ . The clay has  $w_L=56\%$ . (i) calculate the allowable load taking F.S as 3 **10**
- (ii) Determine the settlement of pile group at that load  $\gamma=1.8 \text{ t/m}^3$   $G=2.6$ ,  $e=0.65$  and adhesion factor as 0.45