

CBCS / G.E-II / T.E / CIVIL / Sem 6

- 3 DEC 2019

(3Hours)

Max Marks 80



- N.B**
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
- a. Explain the shear strength characteristics of sand in respect to stress-strain and volumetric changes 05
 - b. Briefly explain any one of the fitting methods for finding coefficient of consolidation 05
 - c. An embankment inclined at an angle of 35° and its height is 15m. The angle of shearing resistance is 15° and $C=200\text{ kN/m}^2$, $\gamma=18\text{ kN/m}^3$. if $S_r=0.06$. find the factor of safety with respect to cohesion 05
 - d. A strip footing is to be designed to carry a gross load of 900 kN/m at a depth of 1m in sand. The shear parameters are $C=0\text{ kN/m}^2$, $\phi=38^\circ$. find the width of footing if factor of safety of 3 is assumed water table is at foundation level $\gamma=18\text{ kN/m}^3$, $\gamma_{sat}=20\text{ kN/m}^3$ given $N_q=49$, $N_{\gamma}=67$ 05
 - e. What is negative skin friction and derive the expression for it in single and group piles 05
- Q.2**
- a. List out the assumptions and limitations of Terzaghi's one dimensional consolidation theory 05
 - b. Describe Swedish circle method for finding factor of safety on finite slopes in pure clays 05
 - c. A 2m thick layer of saturated clay lies between two permeable layers. Clay has the following properties liquid limit =45%, $K=2.8 \times 10^{-7}\text{ cm/s}$, $e=1.25$ and initial effective over burden pressure at the middle of clay layer is 2 kg/cm^2 and likely increases to 4 kg/cm^2 due to the construction of new building find
(1) final void ratio of clay (2) settlement of proposed building (3) time required for 50% consolidation 10
- Q.3**
- a. Explain the merits and demerits of direct shear and triaxial test 05
 - b.

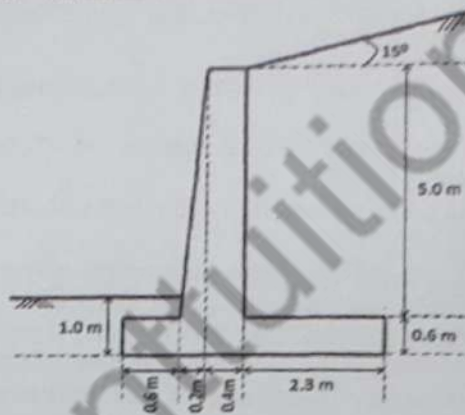
Sample No.	Cell pressure (kg/cm ²)	Deviator stress at failure (kg/cm ²)	Pore pressure at failure (kg/cm ²)
1	1.0	2.02	0.41
2	1.5	2.18	0.62
3	2.0	2.37	0.7

10
- Find the shear parameters of soil considering (i) total stress (ii) effective stress and comment on the result
- c. Classify the piles based on load transfer mechanism and method of installation 05
- Q.4**
- a. A 10 m high cut has been made at an angle of 38° to the horizontal. A possible circular failure surface has a radius of 22 m and is passing through the toe of the cut slope and through a point 5 m away on the top ground from the edge of the cut. The weight of the failure mass is 1500 kN and its centre of gravity is at a distance 10 m from the centre of the failure circle. The properties of soil are $c = 40\text{ kN/m}^2$, $\phi = 18^\circ$ and $\gamma = 20\text{ kN/m}^3$. Determine factor of safety that would be available on the said failure surface for the cut. Use friction circle method 10

TURN OVER

- b. Derive the expression for Rankine's Active earth pressure for cohesive soil 05
 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 05

- Q.5 a. A retaining wall with a smooth vertical back has to retain a backfill of Cohesionless soil of height 5m above ground level. The soil has a void ratio of 0.83 and $G=2.68$.the water table is located at a depth of 2.5m below the top of backfill. The soil above the water table is 20% saturated having ϕ above and below water table are found to be 32° and 28° respectively. Plot the variation of active earth pressure and find the magnitude and point of application of resultant thrust. 10
 b. Check the stability of the cantilever concrete retaining wall shown in Fig. The allowable bearing capacity of the soil is 500 kN/m^2 . Other properties of the soil are as follows: $\phi = 36^\circ$, $\gamma = 18 \text{ kN/m}^3$ and $\delta = 25^\circ$. 10



- Q.6 a. The following data was obtained from Plate load test carried out on a 60cm square plate at a depth of 2m below ground level on a sandy soil. Determine the settlement of foundation 3X3m carrying a load of 110 tons and located at a depth of 2m below ground surface. water table is at greater depth 10

Load Intensity (t/m^2)	0	5	10	15	20	25	30	35	40
Settlement (mm)	0	2.0	4.0	7.5	11	16.3	23.5	34	45

- b. A raft foundation is supported by a pile group consisting of 15 piles arranged in 3 rows. The diameter and length of pile is 300mm and 15m respectively. The spacing between piles is 1.2m. the foundation soil consists of soft clay having $C=3.2 \text{ t/m}^2$ and $\gamma=1.9 \text{ t/m}^3$. Adhesion factor is taken as 0.5. find the capacity of pile group 10