17CV53

Fifth Semester B.E. Degree Examination, June/July 2023
Applied Geotechnical Engineering

Time: 3 hrs.   Max. Marks: 100

Note : 1. *Answer any FIVE full questions, choosing ONE full question from each module.*
2. *Missing data may suitably assumed and reported.*
3. *Use of IS : 6403 permitted.*

Module-1

1 a. What are the objectives of Soil Exploration? With the help of neat sketch, explain Wash Boring method of subsoil exploration. **(10 Marks)**

   b. With the help of neat sketch, explain Seismic Refraction method of soil exploration. By using this method determine the velocity of soil layers and thickness of the top stratum for the following readings.

Time (sec)	0.1	0.2	0.3	0.4	0.45	0.50	0.55
Distance (M)	40	80	120	160	200	240	280

   Geophones are placed at a spacing of 40m in a straight line and the time taken for the last wave to be received is tabulated. **(10 Marks)**

OR

2 a. What is Dewatering? With the help of neat sketch, explain Well Point System Method of dewatering. **(10 Marks)**

   b. With the help of neat sketch, explain Hvorselev method of locating ground water level. By using this method, estimate the ground water table for the following data :
   Depth upto which water is boiled out = 15m ;
   Water rise on First day = 0.80m.
      Second day = 0.70m
      Third day = 0.60m. **(10 Marks)**

Module-2

3 a. Compare Boussinesq's theory with Westergaard's theory. **(06 Marks)**

   b. Explain Construction and uses of Newmarks chart. **(06 Marks)**

   c. A circular area 6m in diameter carries a udℓ of $10kN/m^2$. Determine the vertical stress at a depth of 2, 4 and 8m. Plot the variation of vertical stress with depth. **(08 Marks)**

OR

4 a. Explain the components of settlement and their determination. **(12 Marks)**

   b. A normally consolidated clay layer is 18m thick , natural water content is 45% , saturated unit weight $18kN/m^3$, G = 2.7 and liquid limit is 63%. The vertical stress increment at the centre of clay layer due to foundation load is 9 kPa. Ground water table is at the surface. Determine consolidation settlement. **(08 Marks)**

Module-3

5 a. Explain and obtain expressions for the earth pressure coefficient K_a and K_p by considering cohesionless horizontal backfill surface. **(08 Marks)**

b. What is Stability Number? Obtain expression for the same. By using stability number calculate factor of safety for a 5m deep cut made in a soil having c = 15kN/m^2 and ϕ = 10°, if slope angle is 1:1. What will be the change in factor of safety if the slope angle changed to 1V : 1$\frac{1}{2}$H. The unit weight of soil is 18kN/m^3 and the stability number for ϕ = 10° are as follows : **(12 Marks)**

Slope angle, i	45	30	15
Stability No. S$_n$	0.108	0.075	0.023

OR

6 a. Explain Swedish slip circle method of slices for stability of slopes and obtain expression for factor of safety. **(08 Marks)**

b. A retaining wall of height 10m supports cohesionless horizontal backfill having the following properties : G = 2.65 ; e = 0.65 and ϕ = 30°. The water table is at a depth of 3m from the surface. The backfill horizontal surface carrier uniformly distributed surcharge of 14kN/m^2. Draw lateral active earth pressure distribution diagram. Determine total active earth pressure and its point of application. **(12 Marks)**

Module-4

7 a. With the help of sketch and relationships, explain the effect of water table on the bearing capacity of soil. **(08 Marks)**

b. A square footing 2.8m × 2.8m is built on a homogeneous bed of sand of density 18kN/m^3 and having angle of internal friction of 36°. The depth of foundation is 1.8m below the ground level. Determine the safe load that can be applied on the footing with factor of safety 2.5 by considering N$_c$ = 2.7 , N$_q$ = 30 and N$_f$ = 35 as bearing capacity factors for analysis. **(12 Marks)**

OR

8 a. Write a note on Standard penetration test and corrections to the test readings. **(08 Marks)**

b. A rectangular footing has a size of 1.8m × 3m has to transmit the load of a column at a depth of 1.5m. Calculate the safe load which the footing can carry at a factor of safety of 3 against shear failure. Use IS code method. The soil has following properties :
C = 8kN/m^2 and ϕ = 32.5°. Take bearing capacity factors N$_c$ = 38.13 ; N$_q$ = 25.85 and N$_f$ = 35.21 and unit weight of soil as 18.07kN/m^3. **(12 Marks)**

Module-5

9 a. Classify the various type of piles based on material and function. **(10 Marks)**

b. A square group of 9 piles was driven into soft clay extending to a large length. The diameter and length of the piles were 30cm and 9m respectively. If the unconfined compression strength of the clay is 90kN/m^2 and the pile spacing is 90cm centre to centre, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. **(10 Marks)**

OR

10 a. Explain with a neat sketch the construction and working of under reamed pile. **(12 Marks)**

b. A square pile group of 9 piles passes through recently filled up material of 4.5m depth. The diameter of pile is 30cm and pile spacing is 90cm centre to centre. If the unconfined compressive strength of cohesive material is 60kN/m^2 and unit weight is 15kN/m^3. Compute the negative skin friction of the pile group. **(08 Marks)**

* * * * *