Sixth Semester B.E. Degree Examination, July/August 2021
Geotechnical Engineering - II

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. With a suitable sketch of a typical sampling tube define :
   i) Area ratio ii) Recovery ratio iii) Inside clearance iv) Outside clearance.
   Indicate their recommended values. **(06 Marks)**

   b. What are the objectives of Soil exploration? List the different methods of exploration adopted in the field. **(04 Marks)**

   c. A Seismic refraction survey of an area gave the following data :

Distance from source to Geophone (m)	15	30	60	90	120
Time of receiving wave in seconds	0.025	0.05	0.10	0.11	0.12

   Determine the seismic velocity for the surface and underlying layer. Also, find the thickness of the upper layer. **(06 Marks)**

   d. What is Dewatering? Explain Electro Osmosis method of dewatering. **(04 Marks)**

2 a. List the assumptions of Boussinesq's theory. With all notations , write an expression for determination of vertical stress. **(06 Marks)**

   b. Explain the construction and use of Newmark's chart. **(08 Marks)**

   c. A water tank of total load 12MN is supported on a tower with four legs located on a rectangle of sides 4m and 6m. Calculate the vertical stress at a point 7m below such that, it is i) Below the one of the legs of tower   ii) Below the center of tower at same depth. **(06 Marks)**

3 a. What are Flownets? What are the characteristics of Flownets? **(06 Marks)**

   b. Derive the equation to determine the seepage loss through a homogenous earth dam with a horizontal filter at its toe. **(10 Marks)**

   c. Calculate the seepage loss in m^3/day/m for a hydraulic structure, if the flow net contains 5 flow line and 9 equipotential lines and the head causing flow is 20m.
   Take k of soil = 2.6×10^{-6} cm/sec. **(04 Marks)**

4 a. Define Active Earth Pressure and Passive Earth Pressure. **(04 Marks)**

   b. Explain with a neat sketch, the Culmann's Graphical method of determining the active Earth pressure on a retaining wall. **(08 Marks)**

   c. A retaining wall of height 6.6m retains a cohesionless back fill with properties : $\phi = 25°$, G = 2.6 and e = 0.6. The water table is at a depth of 2.1m below the backfill surface. Draw the earth pressure diagram and calculate the total active thrust on the retaining wall and its position above the base of the wall. Assume soil above water table is dry. **(08 Marks)**

5 a. Explain briefly the various causes of failure of slopes. What are the types of failures in finite slopes? **(06 Marks)**

   b. An embankment of height 10m is to be constructed with a soil having : $\phi = 20°$, C = 20kN/m² ; $\gamma = 17.5$ kN/m³.
   i) What is the side slope for a FoS = 1.5?   ii) If the slope is IV : 1.5H, what is FoS?
   Given : **(08 Marks)**

Slope angle in degrees	90	75	60	45	30
Taylor's stability number (S_n)	0.182	0.134	0.097	0.062	0.025

c. An embankment is 8m high and has a slope of IV : 2H. The soil properties are $C = 33kN/m^2$, $\phi = 12°$. The trial slip circle has a central angle of $\delta = 102°$ and a radius of 16m. Determine FoS given $\sum N = 1200$ kN , $\sum U = 100kN$ and $\sum T = 250$ kN. **(06 Marks)**

6 a. Define : i) Ultimate bearing capacity ii) Net bearing capacity
iii) Safe bearing capacity iv) Allowable bearing pressure. **(06 Marks)**
b. List the assumptions and salient features of Terzaghi's Bearing theory. Write the general b.c. equation for a shallow strip footing. **(06 Marks)**
c. Determine the safe bearing capacity of a square footing of sides 1.8cm located at a depth of 1.5m below GL in a soil having $\gamma = 16.2$ kN/m^3 , $C = 15kN/m^2$ and $\phi = 35°$. Take $N_c = 57.8$, $N_q = 41.4$ and $N_\gamma = 42.4$, FoS = 3. Assume water table at great depth. What will be the SBC, if water table rises upto the base of the footing? **(08 Marks)**

7 a. Differentiate between :
i) Immediate and Consolidation settlement ii) Total and differential settlement.
(08 Marks)
b. A clay stratum 8m thick has a voids ratio of 0.85 at an initial pressure of 15N/m^2 and a voids ratio of 0.723 at a pressure of 300N/m^2. The liquid limit of the soil is 55%. Determine the settlement of clay stratum. **(08 Marks)**
c. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 2m in sandy soil whose compression modulus is 10N/mm^2 and the load due to new building increases the pressure by 160kN/m^2 at the base of the footing. Assume $\mu = 0.28$ and $I_F = 1.06$. **(04 Marks)**

8 a. What are the requirements for selecting location and depth of the foundation? **(04 Marks)**
b. Write an explanatory note on classification of piles on the basis of function, materials and method of installation. **(08 Marks)**
c. Proportion a trapezoidal footing for two columns centre to centre at 3m. One column is 400mm × 400mm carrying 800kN and another is 350mm × 350mm carrying 600 kN load. The footing can extend by 200mm beyond both the column faces. The allowable bearing pressure of soil is 160kN/m^2. Assume the self weight of combined footing is 5% of total load on the combined footing. **(08 Marks)**

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