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Sixth Semester B.E. Degree Examination, Feb./Mar. 2022 Applied Geotechnical Engineering

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS : 6403 is allowed.**

Module-1

- 1 a. What are the objectives of Soil Exploitation? (06 Marks)
- b. Explain Seismic Refraction method with a neat sketch. (08 Marks)
- c. How many types of samples are available? Explain any one sample. (06 Marks)

OR

- 2 a. Define Area ratio , Inside clearance , Outside clearance, with a neat sketch. (06 Marks)
- b. What is the need of dewatering? Explain any one method of dewatering, with a neat sketch. (08 Marks)
- c. Establish the location of GW in clayey strata. Water in bore hole was boiled out to a depth of 10.67m below GS and the size of water was recorded at 24hr. Intervals as follows :
 $h_1 = 64.0\text{cm}$, $h_2 = 57.9\text{cm}$, $h_3 = 51.8\text{cm}$. (06 Marks)

Module-2

- 3 a. Write the expressions for vertical stress, horizontal shear stress of Boussinesq's theory and expression for vertical stress of Westergaard's theory. (06 Marks)
- b. Write a note on Pressure distribution diagrams, with relevant sketches. (08 Marks)
- c. A raft foundation of size $4\text{m} \times 4\text{m}$ carries a uniform load of 200kN/m^2 . Using the point load approximation with four equivalent point loads. Calculate the stress increment at a point in the soil which is 4m below the centre of the loaded area. (06 Marks)

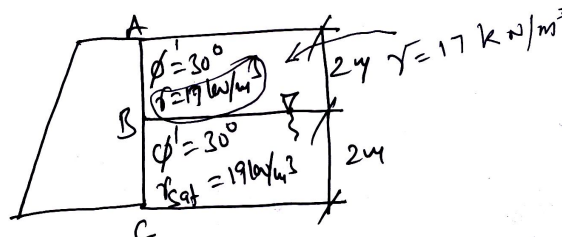
OR

- 4 a. Write a detailed note on the construction of Newmark's chart and also use of that chart, with a neat sketch. (10 Marks)
- b. A normal consolidated clay layer is 18m thick. Natural water content is 45% , Saturated unit weight is 18kN/m^3 , Specific gravity is 2.7 and Liquid limit is 63%. The vertical stress increment at the centre of clay layer due to foundation load is 9kN/m^2 . Determine the settlement. (10 Marks)

Module-3

- 5 a. Define Earth pressure at rest, Active earth pressure and Passive earth pressure, with neat diagrams. (06 Marks)
- b. Explain Culmann's Graphical method, with a neat diagram. (06 Marks)
- c. Determine the lateral earth pressure at rest per unit length of the wall shown in Fig. Q5(c). Also determine the resultant earth pressure. Take $K_0 = 1 - \sin \phi'$, $\gamma_w = 10\text{kN/m}^3$.

Fig. Q5(c)



(08 Marks)

OR

- 6 a. Write a note on Infinite slopes. (06 Marks)
 b. Explain method of slices for C - ϕ soil with a neat sketch. (08 Marks)
 c. A canal having side slopes 1 to 1 is proposed to be constructed in a cohesion soil to a depth of 5m below ground surface. The soil properties are $\phi_4 = 15^\circ$, $C_u = 12\text{KPa}$, $e = 1.0$, $G_s = 2.65$. Using Taylor's stability number, find the factor of safety with respect to cohesion against failure of the bank slopes.
 i) When the canal is full of water ($S_n = 0.08$).
 ii) When there is a sudden drawdown of water in the canal ($S_n = 0.125$). (06 Marks)

Module-4

- 7 a. Define UBC, SBC, SBP, ABP with usual notations. (08 Marks)
 b. What are the assumptions and limitations of Terzaghi's theory? (06 Marks)
 c. A square footing $2.5\text{m} \times 2.5\text{m}$ is built on a homogeneous bed of sand of density 19kN/m^3 and having an angle of shear resistance of 36° . The depth of foundation is 1.5m below the ground surface. Calculate the safe load that can be applied on the footing with a factor of safety 3. Take BC factors as $N_C = 27$, $N_q = 30$, $N_r = 35$. (06 Marks)

OR

- 8 a. Differentiate between GSF, LSF and PSF. (06 Marks)
 b. Write the expression for calculation of bearing capacity from IS code and name the variables. (06 Marks)
 c. A strip footing 2m wide carries a load intensity of 400 kN/m^2 at a depth of 1.2m in sand. The γ_{sat} of sand is 19.5kN/m^3 and unit weight above WT is 16.8 kN/m^3 , $\phi = 35^\circ$. Using Terzaghi's analysis, determine factor of safety with respect to shear failure for the following cases. Take $N_q = 41.4$, $N_r = 42.4$. i) WT is 4m below GL ii) WT is 1.2m below GL. (08 Marks)

Module-5

- 9 a. Write a note on classification of pile based functions. (08 Marks)
 b. Give the expressions for ℓ_{cc} of piles on cohesive and cohesionless soils from IS code with usual notations. (06 Marks)
 c. Write a note on Settlement of pile group on clay. (06 Marks)

OR

- 10 a. What is the significance of Pile group? What are the factors affecting the group capacity η_g ? (06 Marks)
 b. Write a note on under reamed piles with its specification and applications, with a neat sketch. (08 Marks)
 c. As square group of a piles was driven in to soft clay extending to a large depth. The diameter and length of the piles were 30cm and 9m respectively. if the unconfined compressive strength of the clay is 90 KPa, and the pile spacing is 90cm center to centre, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75. (06 Marks)

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