CBCS SCHEME

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17CV53

Fifth Semester B.E. Degree Examination, Aug./Sept.2020
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 permitted.***

Module-1

1 a. Discuss the necessity of sub soil exploration. Mention the stages involved in it. **(06 Marks)**

b. Explain the method of Seismic Refraction method. **(08 Marks)**

c. The field N value in a deposit of fully submerged fine sand was 40 at a depth of 6m. The average saturated unit weight of the soil is $19kN/m^3$. Calculate the corrected N value by applying corrections. **(06 Marks)**

OR

2 a. With the help of a neat sketch of soil sampler, define Area ratio , Inside clearance and outside clearance. State its permissible values for undisturbed sample. **(08 Marks)**

b. What are the methods available for dewatering? Explain anyone method. **(07 Marks)**

c. A soil sample was pushed into the soil for a depth of 600mm and length of the sample obtained was 590m. What is Recovery ratio? What is the state of the sample? How can this be avoided? **(05 Marks)**

Module-2

3 a. Distinguish between Boussinesq's and Westergaard's theory of stress distribution. **(06 Marks)**

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

c. A water tank is supported by a ring foundation having outer diameter of 10m and inner diameter of 7.5m. The ring foundation transmits uniform load intensity of 160 kN/m^2. Compute the vertical stress induced at a depth of 4m, below the centre of ring foundation. Using i) Boussinesq's analysis ii) Westergaard's analysis. Take $\mu = 0$. **(06 Marks)**

OR

4 a. What are settlements? Explain the components of settlement and their determination. **(08 Marks)**

b. Write a note on Pressure bulb. **(04 Marks)**

c. A soft normally consolidated clay layer is 20m thick. The natural water content is 45%. The saturated unit weight is $20kN/m^3$. The grain specific gravity is 2.70 and liquid limit is 60%. The vertical stress increment at the centre of clay layer due to foundation load is 10kpa. The ground water level is at the surface of clay layer. Determine the settlement of foundation if the initial effective stress at the centre of the soil is 100kPa. Assume unit weight of water is $10kN/m^3$. **(08 Marks)**

Module-3

5 a. Differentiate between Rankine's and Coulomb's earth pressure theory. **(06 Marks)**

b. Describe Rebhan's graphical method for active earth pressure calculation. **(06 Marks)**

c. A retaining wall of 5.4m high, retains sand. In the loose state the sand has void ratio of 0.63 and $\phi = 27^0$, while in the dense state, the corresponding values of void ratio and ϕ are 0.36 and 45^0 respectively. Compare the values of active and passive earth pressure in both the states of soil. Assume G = 2.64 , $\gamma_w = 10kN/m^3$. **(08 Marks)**

OR

6 a. Explain the causes for a slope failure and list the modes of finite slope failure. **(06 Marks)**

b. With the help of sketch, explain Swedish slip circle method of stability analysis for cohesive soil. **(06 Marks)**

c. A new canal is excavated to a depth of 5m below ground level, through a soil having the characteristics C = 14kN/m^2 ; $\phi = 15^0$; e = 0.8 and G = 2.70. The slope of banks is 1:1. Calculate the factor of safety with respect to cohesion when canal runs full. If the canal suddenly emptied completely what will be the factor of safety. Take S_n = 0.083 for submerged case ; S_n = 0.122 for Drawdown case. **(08 Marks)**

Module-4

7 a. Define the terms : i) Ultimate bearing capacity ii) Safe bearing capacity iii) Net ultimate bearing capacity iv) Allowable bearing capacity. **(08 Marks)**

b. A footing 3m square carries a gross pressure of 350kN/m^2 at a depth of 1.2m in sand, saturated unit weight of sand is 20kN/m^2 and unit weight above the water table is17kN/m^2. The effective angle of friction is 30^0 and the bearing capacity factors for $\phi' = 30^0$ are N_q = 22m , N_γ = 20. Determine the factor of safety with respect to shear failure for the following cases i) Water table is 5m below the ground level.
ii) Water table is 1.2m below the ground level. **(12 Marks)**

OR

8 a. With the help of neat sketch, differentiate General shear failure and Local shear failure , Punching shear failure. **(08 Marks)**

b. A strip footing 2m wide carries a load intensity of 400kN/m^2 at a depth of 1.2m in sand. The saturated unit weight of sand is 19.5kN/m^3 and unit weight above water table is 16.8kN/m^3. The share strength parameters are C = 0 ; $\phi = 35^0$. Determine the factors of safety with respect to shear failure for the following cases of location of Ground water table.
i) Water table is 4m below ground level ii) Water table is 1.2m below ground level
iii) Water table is 2.5m below ground level. For $\phi = 35^0$ consider N_q = 41.4 ; N_γ = 42.4. **(12 Marks)**

Module-5

9 a. What is Pile foundation? Explain the types of Pile foundation. **(10 Marks)**

b. A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of 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. Which are the methods of finding load carrying capacity of pile? Explain any one method. **(08 Marks)**

b. Write a note on Negative skin friction of Pile. **(06 Marks)**

c. Define Under reamed piles : Under what circumstances it is employed and hence explain how the estimation of its design capacity is done. **(06 Marks)**

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