CBCS SCHEME

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15CV53

Fifth Semester B.E. Degree Examination, June/July 2019
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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. Enumerate the objectives of subsurface exploration. **(04 Marks)**

b. Explain with reference to soil surplus : Area ratio , Inside clearance , Outside clearance and Recovery ratio. **(04 Marks)**

c. Estimate the position of ground water table from the following data :
Depth upto which water is boiled out is 32m. Water raise in the first day : 2.4m , Second day : 2.0m and Third day : 1.6m. **(08 Marks)**

OR

2 a. Distinguish between undisturbed , disturbed and representative soil samples. What are the tests conducted on these samples in the laboratory? **(05 Marks)**

b. Explain 'Seismic refraction method' of soil exploration, with a neat sketch on its mechanism. **(06 Marks)**

c. What is a Bore hole log? List the information recorded in it. **(05 Marks)**

Module-2

3 a. What do you understand by 'Pressure bulb'? Illustrate with a sketch. **(05 Marks)**

b. A circular area 6m is diameter , carries a uniformly distributed load of 10kN/m^2. Plot the variation of vertical stress at depths 2m , 4m and 8m. **(06 Marks)**

c. Explain the principle of 'New – marks chart'. **(05 Marks)**

OR

4 a. What are different types of settlements of footings? Explain. **(04 Marks)**

b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 1.5m in sandy soil whose compression modulus is 10N/mm^2. Footing is expected to transmit a unit pressure of 200kN/m^2. Poisson's ratio of soil is 0.3 and influence factor for footing is 1.06. **(04 Marks)**

c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 300kN/m^2 and load due to new building increases the pressure by 200kN/m^2. The liquid limit of soil is 75% with field water content = 50% and G_S = 2.7. Estimate consolidation settlement. **(08 Marks)**

Module-3

5 a. Explain step by step procedure of Culmann's graphical construction for determination of Active pressure. **(04 Marks)**

b. A 4.5m high retaining wall retains a cohesive soil with C = 10kN/m^2 , $\phi = 20^0$ and γ = 16kN/m^3. Calculate the depth of tension cracks and critical depth. **(04 Marks)**

c. A retaining wall 6.6m high retains a cohesionless soil whose properties are $\phi = 25^0$, G = 2.6 and e = 0.6. The water table is at n depth of 2.1m below GL. Draw the earth pressure diagram and calculate magnitude and position of active earth pressure above the base of the wall. **(08 Marks)**

OR

6 a. What are the causes of slope failure? List and enumerate the types of failures in finite slopes. **(03 Marks)**

b. List and enumerate the types of failures in finite slopes. **(03 Marks)**

c. An embankment 6m high has a slope of 1V : 2H. The soil properties are $C = 5kN/m^2$, $\phi = 30^0$ and $\gamma = 19\ kN/m^3$. A trial slip circle of radius 8.8m and passing thro' the toe has its centre at the same level as the top of embankment. Find the factor of safety by the 'method of slices'. **(10 Marks)**

Module-4

7 a. Define Ultimate bearing capacity , Safe bearing capacity and Allowable bearing pressure. **(03 Marks)**

b. List the assumption made in Terzagh's b.c theory. **(03 Marks)**

c. Determine the safe bearing capacity of a square footing of side 1.8m , located at a depth of 1.5m below GL in a soil having $\gamma = 16.2\ kN/m^3$, $C = 15kN/m^2$ and $\phi = 35^0$. Take $N_c = 57.8$, $N_q = 41.1$ and $N_r = 42.4$ with FS = 3. Assume water tank at great depth, what will be the SBC if WT rises to the base of footing. **(10 Marks)**

OR

8 a. Explain the three modes of shear failure below the footing, with neat sketches. **(04 Marks)**

b. Discuss the effect of size and shape on the bearing capacity of footing on :
i) Sand ii) Clay. **(04 Marks)**

c. Proportion a square footing to carry a load of 900kN from a column 400 × 400mm in section and located at a depth of 1.5m below GL. The soil has $C = 0$, $\phi = 36^0$, $\gamma = 17.5kN/m^3$ above water table and $\gamma_{sat} = 20kN/cm^3$ below water table(WT). The WT is at the base of the footing. Permissible settlement is 25mm , Corrected N – Value = 30. Use a FS = 2. [Use of IS : 6403 is permitted]. No structural design required. **(08 Marks)**

Module-5

9 a. Classify the pile foundations according to material and function, with neat figures. **(04 Marks)**

b. Explain in detail, the principle associated with determination of pile load capacity using static formula. **(04 Marks)**

c. A 12m long, 30mm dia. pile is driven in uniform deposit of sand with $\phi = 40^0$. The W.T is at great depth. The average dry unit weight of sand is $18kN/m^3$. Using Nq = 137, calculate the safe lad capacity of single pile with a FS = 2.5 and angle of wall friction $(\delta) = 30^0$. **(08 Marks)**

OR

10 a. What is meant by efficiency of pile groups? Discuss Feld's rule for its determination. **(04 Marks)**

b. What is Negative friction? Under what situation negative skin friction occurs. **(04 Marks)**

c. Calculate the safe load carrying capacity of a 16 pile group arranged in a square pattern with each pile is of 400mm diameter , 9m length and with a spacing of 1.2m c/c. The soil is 14m deep clay with unconfined strength of $100kN/m^2$, r = $16kN/m^3$ and $r^1 = 9kN/m^3$ with adhesion factor $(\alpha) = 0.7$. W.T is 1m below GL. Use a FS = 2.5. **(08 Marks)**

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