AI-09-QF-24

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CBCS SCHEME

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17CV53

Fifth Semester B.E. Degree Examination, Jan./Feb. 2023
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define subsurface exploration. What are its objectives? **(06 Marks)**

b. Explain undisturbed, disturbed and representative soil samples. **(06 Marks)**

c. A sampling tube has inner diameter of 70mm and cutting edge thickness of 6.8mm. Its outside diameters are 72mm and 74mm respectively. Determine the area ratio, inside clearance and outside clearance of the sample. This tube is pushed at the bottom of the bore hole to a distance of 550mm. With the length of the sample being 530mm, find the recovery ratio. **(08 Marks)**

OR

2 a. What is meant by drainage and dewatering? Explain well point dewatering technique. **(06 Marks)**

b. Write short note on stabilization of bore holes. **(06 Marks)**

c. Establish the location of ground water in a clayey stratum. Water in the bore hole was boiled out to a depth of 10.5m below ground surface and the rise of water was recorded at 24 hour interval as follows. $h_1 = 0.63m$, $h_2 = 0.57m$ and $h_3 = 0.51m$. **(08 Marks)**

Module-2

3 a. Distinguish between Boussinesq's and Westergaard's theories of stresses in soil. **(06 Marks)**

b. Explain construction and uses of Newmark's chart. **(06 Marks)**

c. A point load due to monument acts on the ground surface. Calculate the vertical pressure at point 5m directly below the load and at a distance of 4m from the load. Assume $\mu = 0$. Use (i) Boussinesq's analysis (ii) Westergaard's analysis. **(08 Marks)**

OR

4 a. Explain the components of settlements and their determination. **(06 Marks)**

b. Describe the remedial measures against harmful settlements. **(06 Marks)**

c. A square footing 1.2m × 1.2m rests at a depth of 1.2m in a saturated clay layer 5m deep. The clay is normally consolidated. The soil has liquid limit of 30%, $\gamma_{sat} = 17.8\ kN/m^3$, $\omega = 28\%$ and G = 2.68. Determine the settlement if the footing is loaded with 100 kN. **(08 Marks)**

Module-3

5 a. Explain active and passive earth pressure with the help of sketches. **(06 Marks)**

b. Describe Rebhann's graphical method of finding active earth pressure on a retaining wall. **(06 Marks)**

c. A vertical smooth wall 6m high retains cohesionless soil with $\phi = 28°$, G = 2.70 and e = 0.72. Water table is at a depth of 2.5m from top. A uniform surcharge of 40 kN/m^2 is applied on top of backfill surfaces. Assume soil above water table is dry. Draw the active earth pressure diagram and obtain the magnitude and location of active earth pressure using Rankine's theory. **(08 Marks)**

OR

6 a. Explain the various types of soil failures. **(06 Marks)**

b. Explain the method of slices for slope stability analysis. **(06 Marks)**

c. Calculate the factor of safety with respect to cohesion of clay, slope laid at 1 in 2 to a length of 12m. If the angle of internal friction ϕ = 15°, Taylors stability number 0.064, C = 20 kN/m^2 and γ = 19 kN/m^3. Determine the critical height of the slope in this soil. **(08 Marks)**

Module-4

7 a. Define the following :
(i) Ultimate bearing capacity (ii) Safe bearing capacity (iii) Net ultimate bearing capacity. **(06 Marks)**

b. List the assumptions of Terzaghi's bearing capacity theory. **(06 Marks)**

c. A square footing fails by general shear in a cohesionless soil under an ultimate load of 3000 kN. The footing is placed at a depth of 3m below ground level. Take ϕ = 35°, N_q = 41.4 , Nγ = 42.4 and γ = 19 kN/m^3. Determine the size of the footing if the water table is at a greater depth. **(08 Marks)**

OR

8 a. Explain plate load test to determine the bearing capacity of soils. **(06 Marks)**

b. Discuss the factors influencing the bearing capacity of soil. **(06 Marks)**

c. A plate load test was conducted on a 300 mm square plate and the observed settlement was 17mm. What will be estimated settlement for a square footing of side 2.0m in
i) Cohesion soil ii) Cohesionless soil **(08 Marks)**

Module-5

9 a. Explain the classification of piles based on function and materials. **(10 Marks)**

b. 200mm diameter, 8m long piles are used as foundation for a column in a uniform deposit of medium clay (q_u = 100 kN/m^2). The spacing between the piles is 500mm. There are 9 piles in the ground arranged in a square pattern calculate the ultimate pile load capacity of the group. Assume adhesion factor = 0.9. **(10 Marks)**

OR

10 a. Explain : (i) Negative skin friction (ii) Under reamed piles. **(10 Marks)**

b. A group of 16 piles, 10m long is used as a foundation for a bridge pier. The piles used are 30cm diameter with center to center spacing of 12m. The subsoil consists of clay with unconfined compressive strength of 15 kN/m^2. Determine the efficiency neglecting the bearing action. Take adhesion factor as 0.9. **(10 Marks)**

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