

CBCS SCHEME

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17CV53



Fifth Semester B.E. Degree Examination, Jan./Feb. 2021

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 permitted.**

Module-1

- 1 a. Enumerate the objectives of soil investigation. (06 Marks)
b. Explain the wash boring method of soil exploration with a neat sketch. (07 Marks)
c. With a neat sketch of soil sampler, define:
i) Area ratio ii) Inside clearance iii) Outside clearance iv) Recovery ratio. (07 Marks)

OR

- 2 a. Distinguish between disturbed, undisturbed and representative samples, for which type of test the samples are suited. (06 Marks)
b. What is meant by drainage and dewatering? Explain electro-osmosis method of dewatering. (07 Marks)
c. Explain the Hvorslev's method of locating the ground water table. (07 Marks)

Module-2

- 3 a. Distinguish between Boussinesq and Westergaard's theory of stress distribution. (06 Marks)
b. Explain equivalent point load method of determining vertical stress at a point within loaded area. (07 Marks)
c. A load of 1000kN acts as a point load at the ground surface. Estimate the stress at a point 2m below and 4m away from the point of action of the load by Boussinesq's formula. Compare with Westergaard's formula. (07 Marks)

OR

- 4 a. A concentrated load 1000kN acts at the ground surface. Construct a 25% isobar. (06 Marks)
b. Explain the construction and use of Newmark's chart. (07 Marks)
c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is 300kPa and load due to the new building increases the pressure by 200kPa. The liquid limit of the soil is 75%, water content = 50% and $G = 2.7$. Estimate the consolidation settlement. (07 Marks)

Module-3

- 5 a. Distinguish between active and passive earth pressure. What are the assumptions made in the Rankine's earth pressure theory? (06 Marks)
b. Explain the Culmann's graphical method of determining the active Earth pressure. (07 Marks)
c. A Smooth vertical wall of height 4.5m retains a cohesion less backfill with $\phi = 30^\circ$, void ratio = 0.62 and $G = 2.7$. If the soil is completely dry, draw the earth pressure distribution on the wall. If the water table rises to the top of the soil, compute the total earth pressure on the wall. (07 Marks)

OR

- 6 a. Explain the causes for a slope failure. Explain with neat sketch the different modes of slope failure. (06 Marks)
- b. Explain the method of slices for slope stability analysis. (07 Marks)
- c. Calculate the factor of safety with respect to cohesion of clay, the slope laid at 1 in 2 to a length of 11m. If the angle of internal friction $\phi = 10^\circ$, Taylor's stability number is 0.064, $c = 20\text{kN/m}^2$ and $\gamma = 19\text{kN/m}^2$. Determine the critical height of the slope. Determine the critical height of the slope in this soil. (07 Marks)

Module-4

- 7 a. What are the assumptions made in Terzaghi's theory? Write the expression for ultimate bearing capacity of strip footing, square and circular footing. (10 Marks)
- b. The footing of a column $2.5 \times 2.5\text{m}$ is founded at a depth of 1.5m on a cohesive soil of unit weight 18kN/m^3 . Take $C = 30\text{kN/m}^2$, $\phi = 0$. What is the safe load for this footing? (10 Marks)

OR

- 8 a. With the help of neat sketch, explain the effect of water table on the bearing capacity of soil. (10 Marks)
- b. Explain standard penetration test with suitable corrections. How do you access b.c. of shallow footings on sand using SPT test data? (10 Marks)

Module-5

- 9 a. List and explain the classification of piles based on function and material. (10 Marks)
- b. A square pile group of 9 piles of 250mm diameter is arranged with a pile spacing of 1m. The length of the pile is 9m. The unit cohesion of clay is 75kN/m^2 . Neglecting bearing at the tip of the piles. Determine the group capacity. Assume adhesion factor of 0.75ϕ . (10 Marks)

OR

- 10 a. Write a note on negative skin friction. (10 Marks)
- b. Write a note on under-reamed piles. How can the ultimate load carrying capacity of under-reamed piles can be estimated. (10 Marks)

