CBCS SCHEME

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21CV54

Fifth Semester B.E. Degree Examination, June/July 2024
Geotechnical Engineering

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With the help of phase diagram, define the following terms:
i) Void Ratio ii) Saturated density iii) Degree of saturation iv) Moisture content. **(08 Marks)**

b. Describe the method of determining liquid limit of soil by Casagrande's method. **(08 Marks)**

c. Explain the classification of fine grained soil using plasticity chart. **(04 Marks)**

OR

2 a. Define the following:
i) Specific gravity of soil.
ii) Relative density
iii) Liquid limit of soil
iv) Plastic limit of soil. **(08 Marks)**

b. With usual notations prove that es = WG. **(04 Marks)**

c. Explain the procedure of determining water content of soil by oven drying method. **(08 Marks)**

Module-2

3 a. List and explain the factors affecting permeability of soil. **(08 Marks)**

b. Differentiate between discharge velocity and seepage velocity. **(04 Marks)**

c. A soil deposit 8m thick has bulk unit weight of 20kN/m^3. If the water table is at a depth of 3m below ground surface and soil above water table is saturated by capillary water. Find total, effective and neutral stress @ 8m, 3m and 0m depth. **(08 Marks)**

OR

4 a. Describe an experiment to determine permeability of clayey soil with a neat sketch. **(08 Marks)**

b. Write a short notes on: Quick sand phenomenon. **(04 Marks)**

c. A clay strata 6m thick is laying below a sand layer 5m thick. The water table is at a depth of 2m from the surface, the sand has a porosity of 40% and G = 2.7. Sand above the water table may be taken as a dry. The water content of soil 60% and G = 2.65. Calculate the total stress, pore water pressure and effective stress at the middle of the clay layer. **(08 Marks)**

Module-3

5 a. List and explain the factors affecting compaction property of soil. **(08 Marks)**

b. Explain the procedure to find pre consolidation pressure. **(06 Marks)**

c. Give step by step procedure of finding compaction properties through standard proctor test. **(06 Marks)**

OR

6 a. List the assumptions made in Terzaghi's one dimensional consolidation theory. (08 Marks)
  b. Explain the effect of compaction on soil properties. (06 Marks)
  c. Describe laboratory one dimensional consolidation test. (06 Marks)

Module-4

7 a. Explain consolidation process through mass-spring analogy. (10 Marks)
  b. With neat sketch explain direct shear test. (10 Marks)

OR

8 a. With neat sketch explain triaxial shear test. (10 Marks)
  b. List and explain the factors affecting shear strength of soil. (10 Marks)

Module-5

9 a. Explain Terzaghi's method to determine the bearing capacity of soil. (10 Marks)
  b. A strip footing 2.5m wide at its base is located at a depth of 1.5m below the ground surface. The properties of the foundation soil are : $\gamma = 18kN/m^3$, $\phi = 20°$ and $C = 30kN/m^2$. Determine the safe bearing capacity, using a factor of safety 3, if the water table is at a depth of 1m below the ground surface and at the ground surface. Use Terzaghi's analysis. Take $N_C = 17.7$, $N_q = 7.4$, $N_\gamma = 5.0$. (10 Marks)

OR

10 a. Explain the different modes of shear failure with neat sketch. (10 Marks)
  b. A 3.0m square footing is located in a dense sand at a depth of 2.0m. Determine ultimate bearing capacity for the following water table positions:
  i) At the ground surface
  ii) At footing level
  iii) At 1m below the footing.
  The moist unit weight of sand above the water table is $18kN/m^3$ and the saturated weight is $20kN/m^3$, $\phi = 35°$ and $C = 0$. Take $N_q = 33$ and $N_\gamma = 34.0$ (10 Marks)

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