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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