CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, July/August 2021
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

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.

1 a. With the help of the phase diagram, explain :
i) Dry density ii) Water content iii) Degree of saturation iv) Porosity. **(06 Marks)**

b. With usual notations, prove that $\gamma_d = \frac{G\gamma_w}{1+e}$. **(06 Marks)**

c. A soil sample weighing 19kN/m^3 has a water content of 30%. The specific gravity of soil particles is 2.70. Determine voids ratio, porosity and degree of saturation. **(08 Marks)**

2 a. Explain with the help of particle size distribution curve, the following types of soil.
i) Well graded soil ii) Poorly graded soil. **(06 Marks)**

b. Explain the Indian standard soil classification system. **(06 Marks)**

c. The following readings were recorded during liquid limit test.

No. of blows	40	30	18	13
Water content (%)	35	37	39	42

Obtain the flow curve and find the liquid limit and flow index. **(08 Marks)**

3 a. Explain electrical diffuse double layer and absorbed water. **(06 Marks)**

b. With the help of neat sketches, explain any two clay minerals. **(06 Marks)**

c. During a compaction test a soil attains a maximum dry density of 18kN/m^3 at a water content of 12%. Determine the degree of saturation and percent air voids at maximum dry density. Also find the theoretical maximum dry density corresponding to zero air voids at optimum moisture content. Take G = 2.77. **(08 Marks)**

4 a. Explain the factors affecting the degree of compaction. **(06 Marks)**

b. Distinguish between standard proctor and modified proctor compaction tests. **(06 Marks)**

c. The following data refer to I.S light compaction list in a cylindrical mould of 1000 CC volume

Water content (%)	10	12	14.3	16	18.3
Weight of wet sample (kN)	19.63	21.37	21.93	21.68	21.14

Specific gravity of solids is 27. Plot the compaction curve and obtain maximum dry unit weight and optimum moisture content. Also draw the zero air void line. **(08 Marks)**

5 a. Define Darcy's Law derive an expression to relate discharge velocity and seepage velocity. **(06 Marks)**

b. Explain the factors affecting the permeability of soil. **(06 Marks)**

c. A sample in a variable head permeameter is 80mm in diameter and 100mm high. The permeability of the sample is estimated to be 10×10^{-3}mm/sec. If it is desired that the head in the stand pipe should fall from 240mm to 120mm in 3 minutes, determine the size of the stand pipe to be used for the test. **(08 Marks)**

6 a. With a neat sketch, explain the method of locating phreatic line for a homogeneous earth dam with a horizontal filter. **(06 Marks)**

b. Explain the following terms :
i) Total stress ii) neutral stress iii) effective stress iv) quick sand condition. **(06 Marks)**

c. A flow net drawn for seepage below a dam has 4 flow channels and 9 equipotential lines. There is 8m of water on the upstream side and no water on downstream of the dam. $K_x = 4 \times 10^{-4}$cm/sec and $K_y = 2 \times 10^{-4}$cm/sec. Calculate the seepage loss per day for every 100m length of the dam. **(08 Marks)**

7 a. Explain mass spring analogy of consolidation of soil. **(06 Marks)**

b. Explain under consolidated, normally consolidated and over consolidated soils. **(06 Marks)**

c. The time for 40% consolidation of a two way drained saturation clay sample of 10mm thick in the laboratory is 40 sec. Determine the time required for 60% consolidation of the same soil 12m thick on an impervious layer subjected to same loading condition on the laboratory sample. **(08 Marks)**

8 a. Explain Casagrande method of determination of preconsolidation pressure. **(06 Marks)**

b. List the assumptions of Terzagh's one dimensional consolidation theory. **(06 Marks)**

c. A 2.2m thick layer of clay is suspected to a load increment of 200kN/m^2. A representation sample of the soil when tested in the laboratory showed that change in voids ratio corresponding to the same load increment was 0.10. If the initial void ratio is 0.62, determine the coefficient of volume compressibility and settlement of clay layer. **(08 Marks)**

9 a. Explain Mohr-Coulomb theory of shear strength. **(06 Marks)**

b. Explain the classification of shear tests based on drainage conditions. **(06 Marks)**

c. A soil ha unconfined compression strength of 120kN/m^2. In a triaxial compression test specimen of same soil when subjected to cell pressure of 40kN/m^2 failed at an additional stress of 160kN/m^2. Determine shear strength parameters. **(08 Marks)**

10 a. What are the factors affecting the shear strength of soil. **(06 Marks)**

b. What are the advantages and disadvantages of direct shear test? **(06 Marks)**

c. A vane 112.5mm long and 75mm in diameter was pressed into a soft soil at the bottom of a base hole. Torque was applied to fail the soil. The shear strength of clay was found to be 37 kN/m^2. Determine the torque that was applied. **(08 Marks)**

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