CBCS SCHEME

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17CV45

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Basic 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 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)**

OR

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)**

Module-2

3 a. List and explain various soil structures. **(06 Marks)**

b. What is the effect of compaction on soil properties? **(06 Marks)**

c. Following are the results of a standard proctor compaction test on a soil :

Water content, %	8.5	12.2	13.75	15.5	18.20
Weight of wet soil in kgs	1.8	1.94	2.0	2.04	2.03

Plot the compaction curve and get maximum dry density and OMC. Also plot ZAV line. Take G = 2.75 and volume of mould as 995 c.c. **(08 Marks)**

OR

4 a. Describe the three principal clay minerals. **(08 Marks)**

b. Explain electrical diffuse double layer and adsorbed water. **(06 Marks)**

c. What are the factors which affect compaction? **(06 Marks)**

Module-3

5 a. Explain characteristics of flow net and list its applications. **(07 Marks)**

b. Obtain an expression for average co-efficient of permeability when flow is perpendicular to bedding planes. **(06 Marks)**

c. Flow net is constructed for an earthen dam 180 m long with an effective water storage height of 25 mtrs. The co-efficient of permeability of soil is 2.78×10^{-4} cm/sec. Number of potential drops are 10, Number of flow channels = 4. Find seepage loss across the dam per day assuming dry downstream. **(07 Marks)**

OR

6 a. Discuss factor affecting co-efficient of permeability of soils. **(06 Marks)**

b. Explain with necessary sketches drawing of phreatic line in an earthen dam without toe filter. **(06 Marks)**

c. The diameter and height of soil specimen in a falling head permeability test are 9.5 cm and 14 cm respectively. Dia of stand pipe is 1.20 cms. During the test water level in stand pipe found to fall from 70 cm to 55 cm in 18 minutes. Find

(i) Co-efficient of permeability of soil.

(ii) Time in minutes required for water level to drop from 55 to 30 cm. **(08 Marks)**

Module-4

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)**

OR

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)**

Module-5

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

b. Explain the advantages and disadvantages of direct shear test over triaxial shear test. **(06 Marks)**

c. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and was 80mm long. The load at failure measured as 30N and the axial deformation of the sample of failure was 12mm. Determine the unconfined compressive strength and undrained shear strength of clay. **(08 Marks)**

OR

10 a. Explain sensitivity and thixotropy. **(06 Marks)**

b. Explain vane shear test with a neat sketch. **(06 Marks)**

c. The triaxial tests carried out on soil samples gave the following results:

Confining pressure, kN/m^2	50	100	150
Deviator stress, kN/m^2	76	132	186
Pore water pressure, kN/m^2	35	59	83

Plot Mohr's circle and obtain effective shear parameters. **(08 Marks)**

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