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15CV45

Fourth Semester B.E. Degree Examination, [illegible] 2020
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: **80**

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

Module-1

I a. Define : Void ratio , Porosity , Degree of saturation and Air content. **(04 Marks)**

b. Derive the expression for dry density of soil in the form

$$\gamma_d = \frac{(1-n_a)G_s\gamma_w}{1+wG_s}$$ with usual notations. **(06 Marks)**

c. Define Liquid limit , Relative consistency and Toughness index. **(06 Marks)**

OR

2 a. State Stoke's law. List the assumptions **(04 Marks)**

b. Explain with the help of particle size distribution curves : Well graded soil , Poorly graded soil and Gap graded soil. **(06 Marks)**

c. A fully saturated soil sample has a water content of 35% and specific gravity of 2.65. Determine its porosity , saturated unit weight and dry unit weight. **(06 Marks)**

Module-2

3 a. What are the different types of clay minerals commonly found in soils? Explain any one with their structure. **(06 Marks)**

b. The observations of a standard proctor test are as follows :

Dry density , KN/m^3	16.16	17.06	18.61	18.95	18.78	17.13
Water content , %	5	8.81	11.25	13.05	14.40	19.25

i) Plot the compaction curve and determine OMC and $\gamma_{d\,max}$.

ii) Also compute void ratio and degree of saturation at optimum condition. Take G = 2.77. **(10 Marks)**

OR

4 a. Differentiate between Standard and Modified Proctor's tests. **(04 Marks)**

b. Discuss the effect of compaction on different properties of soil. **(06 Marks)**

c. Explain Electrical diffuse double layer and Adsorbed water. **(06 Marks)**

Module-3

5 a. Differentiate between : i) Seepage velocity and discharge velocity

ii) Coefficient of permeability and coefficient of percolation. **(04 Marks)**

b. Derive an expression for the determination of coefficient of permeability by falling head permeameter. **(06 Marks)**

c. An earthen dam 300m long is built on an impervious foundation with a horizontal filter under the d/s slope. The horizontal and vertical permeability's of the soil are 5 x 10^{-5} m/sec and 2 x in/sec respectively. The full reservoir level is 20m above the downstream filter. The flow net consists of 4 flow channels and 16 equipotential drops. Estimate the seepage loss in litres per day per unit length of the darn. **(06 Marks)**

Note : 1. On completing your answers, compulsorily draw diagonal
2. Any revealing of identification, appeal to evaluator and /or

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OR

6 a. What is a Flownet? Briefly explain the characteristics and uses of tlownets. **(08 Marks)**

b. A clay structure of thickness 8m is located at a depth of 6m below the ground surface, it is overlayed by fine sand, the water table is located at a depth of 2m below ground surface. For fine sand submerged unit weight is 10.2 kN/m^3. The moist unit weight of sand located above water table is 16kN/m^3. For clay layer G = 2.76 and w = 25%. Compute the effective stress at the middle of clay layer. **(08 Marks)**

Module_4

7 a. What are Curve fitting methods used in consolidation test? Explain anyone with a neat sketch. **(08 Marks)**

b. A bed of compressible clay, 4m thick has pervious sand at top and an impervious rock at the bottom. In a consolidation test on an undisturbed sample of clay from this deposit, 90% settlement was reached in 4 hours. The sample was 20mm thick. Estimate the time in years for the building founded over this deposit to reach 90% of its final settlement. **(08 Marks)**

OR

8 a. Differentiate compaction from consolidation. **(04 Marks)**

b. Define the terms : Coefficient of compressibility , Coefficient of consolidation and Compression index. **(06 Marks)**

c. Explain the significance of preconsolidation pressure. Describe Casagrande's method of determining it. **(06 Marks)**

Module-5

9 a. Explain Mohr — Coulomb failure theory. **(04 Marks)**

b. Explain Sensitivity and Thixotropy of clay. **(06 Marks)**

c. A shear vane of 75mm diameter and 110mm length was used to measure the shear strength of a soft clay. If a torque of 600 N-m was required to shear the soil, calculate the shear strength. The vane was then rotated rapidly to cause remoulding of the soil. The torque required in the remoulded state was 200 N-m. Determine the sensitivity of the **soil.(06 Marks)**

OR

10 a. What are the advantages and disadvantages of direct shear test over triaxial test? **(08 Marks,:-**

b. A direct shear test was carried out on a cohesive soil sample and the following results were obtained :

Normal stress, kN/m^2	150	250
Shear stress at failure kN/m^2	110	120

What would be the deviator stress at failure, if a triaxial test is carried out on the same soil with a cell pressure of 150kN/m^2. **(08 Marks)**

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Normal stress, kN/m^2	150	250
Shear stress at failure kN/m^2	110	120

What would be the deviator stress at failure, if a triaxial test is carried out on the same soil with a cell pressure of I 50kN/m^2. **(08 Marks)**

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