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18CV54

Fifth Semester B.E. Degree Examination, June/July 2024
Basic Geo Technical Engineering

Time: 3 hrs.   Max. Marks: 100

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

Module-1

1 a. Define the following from the phase diagram :
   i)Void ratio   ii) porosity ii) degree of saturation iv) percent air voids v) air contact.
   (05 Marks)

   b. Prove the following relationship from the phase diagram :
   $$r_b = \left(\frac{G_S + S.e}{1+e}\right) r_w.$$
   (07 Marks)

   c. The soil has porosity of 40% and specific gravity of 2.7. Then calculate void ratio, dry unit weight (r_d) and unit weight for 50% saturation and 100% saturation. **(08 Marks)**

OR

2 a. Classify the soil is well graded or poorly graded from the sieve analysis. **(07 Marks)**
   b. Define the following indices :
   i)   Plasticity index
   ii) Liquidity index
   iii) Consistency index
   iv) Toughness index
   v)   Density index. **(05 Marks)**

   c. Write a note on ISCS for classification of soil and also explain the use of plasticity chart with an example. **(08 Marks)**

Module-2

3 a. Describe single grained, honey combed flocculent and dispersed structures. **(06 Marks)**
   b. Write a note on diffuse double layer. **(06 Marks)**
   c. Explain 3 different clay minerals with neat sketches. **(08 Marks)**

OR

4 a. Write a note on factors affecting compaction. **(05 Marks)**
   b. How do you calculate placement water context by using protocol's needle method? **(07 Marks)**
   c. Plot the compaction curve and determine OMC and maximum dry density, also determine the degree of saturator and percentage of air voids at maximum dry density. The SPCT values are as given below :

W.C%	·5	10	14	20	25
Bulk density (kN/m³)	17.6	19.8	21.0	21.7	21.5

   (08 Marks)

Module-3

5 a. Write a note on confined pumping flow test for calculation of coefficient of permeability. **(06 Marks)**

b. How do you calculate the coefficient of permeability for horizontal flow in the case of stratified soils? **(06 Marks)**

c. A constant head permeability test was run as a sand sample of 16cm in length and $60cm^2$ in c/s area. Porosity was $n_1 = 40\%$ under a constant head of 30cm, the discharge was found to be $45cm^3$ in 18sec. Calculate the coefficient permeability. Also determine the discharge velocity and seepage velocity during the test. Estimate the permeability of the sand for a porosity of $n_2 = 35\%$. **(08 Marks)**

OR

6 a. Explain the characteristics of flow nets with a neat sketch. **(06 Marks)**

b. How do you locate the phreatic line in a day with filth by using a Casagrande's method? **(10 Marks)**

c. Write a note on quick sand phenomena. **(04 Marks)**

Module-4

7 a. Write a note on Mohr-coulomb failure criteria. **(08 Marks)**

b. List out the factors affecting the shear strength of soils. **(06 Marks)**

c. Write a note on sensitivity and thixotropy. **(06 Marks)**

OR

8 a. What are the advantages of triaxial test over direct shear test? **(06 Marks)**

b. Write a note on vane –shear test. **(06 Marks)**

c. A series of direct shear tests was conducted as a soil, each test was carried out till the sample failed. The results are as following. Determine the cohesion intercept and the angle of shearing resistance.

Sample no. 1	Normal stress (KPa)	Shear stress (KPa)
1	15	18
2	20	25
3	45	32

(08 Marks)

Module-5

9 a. What are the assumptions and limitations of Terzaghi's 1 – D consolidation theory? **(08 Marks)**

b. Define the following : i) C_C ii) C_V iii) a_v iv) m_v. **(06 Marks)**

c. Explain the Casagrande's method for data mining the pre-consolidation pressure. **(06 Marks)**

OR

10 a. Define normally consolidation over consolidate and under consolidated soils. **(06 Marks)**

b. Write a note on square root of time fitting method for calculation of coefficient of consolidation. **(08 Marks)**

c. In a consolidation test on a soil, the void ratio of the sample decreases from 1.242 to 1.12 when the pressure is increased from 20 to 40 tons/m^2. Calculate the coefficient of consolidation. Given that the coefficient of permeability of the soil during this pressure increases, $K = 8.5 \times 10 - 3$ cm/sec. **(06 Marks)**

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