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15CV45

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
Basic Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. With the help of phase diagram, explain :
i) Dry soil ii) Partially saturated soil iii) Saturated soil. **(06 Marks)**

b. With the usual notations prove es – WG. **(04 Marks)**

c. A natural deposit of soil has a water content of 23.5% and bulk unit weight of 18kN/m^3. The specific gravity of soil grain is 2.65. Determine void ratio, dry unit weight and design of saturation. **(06 Marks)**

OR

2 a. State Stoke's law. What are its assumptions and limitations? **(06 Marks)**

b. What is Consistency limit of soil? List the consistency limits. **(04 Marks)**

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

No. of blows (N)	40	31	16	13
Water content %	34.7	35.3	38.1	38.7

Obtain the flow curve and find the liquid limit and flow index. **(06 Marks)**

Module-2

3 a. List and explain common clay minerals in soil. **(08 Marks)**

b. A partially saturated sample from a borrow pit has a natural water content of 14% and bulk unit weight of 19kN/m^3. The specific gravity of solid is 2.70. Determine the voids ratio and degree of saturation. What will be the unit weight of sample on saturation? **(08 Marks)**

OR

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

b. List the difference between compaction and consolidation. **(04 Marks)**

c. In a Standard proctor test, following results were obtained :

Weight N	17	18.90	20	19.60
Water content %	7.7	11.50	14.60	19.70

Draw the compaction curve showing OMC and MDD. Given volume of mould = 950 CC and G = 2.65. **(06 Marks)**

Module-3

5 a. Derive the formula used to determine the coefficient of permeability in the Falling head permeability test. **(06 Marks)**

b. Discuss the factors affecting the permeability of soil. **(04 Marks)**

c. Calculate the horizontal and vertical permeabilities of a soil deposit consisting of three layers 150cm , 180cm and 200cm thick with permeability 10^{-5} , 10^{-7} and 10^{-9} m/sec respectively. **(06 Marks)**

OR

6 a. What is a Flow Net? List their characteristic. **(06 Marks)**
b. Define Seepage velocity. Superficial velocity and Coefficient of percolation. **(04 Marks)**
c. Explain the Graphical method of determining the phreatic line in a homogeneous earthen dam without any filter. **(06 Marks)**

Module-4

7 a. Explain normally consolidated and over consolidated soils. How preconsolidation pressure is determined in the laboratory. **(08 Marks)**
b. An undisturbed sample of clay stratum 2cm thick was tested in the laboratory and the average coefficient of consolidation was found to be 2×10^{-4} cm^2/sec. If a structure is built on the clay stratum, how long will it take to attain half the ultimate settlement under the load of the structure? Assume double drainage condition. **(08 Marks)**

OR

8 a. Explain Logarithm of Time filling method with a neat sketch. **(08 Marks)**
b. A clay layer whose total settlement under a given loading is expected to be 12cm settles 3cm at the end of one month after the application of load increment. How many months will be required to reach a settlement of 6cm? How much settlement will occur in 10 months? Assume double drainage condition. **(08 Marks)**

Module-5

9 a. Explain Mohr – Coulomb theory of Shear strength. **(06 Marks)**
b. Explain the limitations of Direct shear test. **(04 Marks)**
c. An unconfined compression test was conducted on an undisturbed sample of clay. The sample had a diameter of 38mm and length 76mm. The load at failure was 30N and the axial deformation of the sample is 11mm. Determine the undrained shear strength of parameter. If the failure plane made an angle of 50° with horizontal. **(06 Marks)**

OR

10 a. Explain the factors affecting shear strength of soil. **(06 Marks)**
b. Explain Total , Neutral and Effective stresses in soil. **(04 Marks)**
c. The results of consolidation quick test of a soil sample is given below :

Sample No	Consolidation pressure kN/m^2	Deviator stress kN/m^2	Pore water pressure kN/m^2
1	70	230	- 20
2	350	550	90

(06 Marks)

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