CBCS SCHEME

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17CT53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define Soil Mechanics. Briefly explain Origin and Formation of Soil. **(04 Marks)**

b. A soil sample weighs 16.5kN/m^3 as the water content of 28%. The specific gravity of soil partial is 2.7. Determine the dry unit weight, void ratio Porosity and degree of saturation. **(10 Marks)**

c. With usual notation derive the expression.

$$\gamma_d = \frac{G\gamma_w}{1+e}$$ **(06 Marks)**

OR

2 a. Explain with neat sketch procedure to determine specific gravity of Soil Solids with formula. **(08 Marks)**

b. With the help of particle size distribution curve, Explain: i) Well graded soil ii) Co- efficient of curvature (C_c) iii) Co-efficient of uniformity (C_u) iv) Uniformly graded. **(05 Marks)**

c. The maximum and minimum dry unit weight of sand determined in the lab are 20kN/m^3 and 15kN/m^3 respectively. If the relative density of sand is 74%. Determine the porosity of sand. **(07 Marks)**

Module-2

3 a. With the help of sketch, explain the following soil structure:
i) Dispersed
ii) Flocculent
iii) Single grained
iv) Honey comb. **(08 Marks)**

b. Write a short note on Electrical diffuse double layer with figure. **(06 Marks)**

c. Explain with neat sketch of following clay mineral:
i) Kaolinite
ii) Illite
iii) Montmorillonite. **(06 Marks)**

OR

4 a. Define compaction. List the principle of compaction. **(04 Marks)**

b. Explain standard protor test, with Neat sketch. **(10 Marks)**

c. List the factors affecting compaction. Briefly explain any two. **(06 Marks)**

Module-3

5 a. Define permeability. List out the assumption and limitations of Darcy's law. **(10 Marks)**

b. Obtain an expression $K = 2.303\frac{aL}{At}\log_{10}\frac{h_1}{h_2}$ falling head permeability test. **(10 Marks)**

OR

6 a. Derive Laplace equation $\upsilon_x = \frac{\partial \phi}{\partial x}$, $\upsilon_z = \frac{\partial \phi}{\partial z}$. **(10 Marks)**

b. Calculate the coefficient of permeability of a soil sample 6cm in height and 50cm^2 in cross-section area, if a quantity of water is equal to 430cc passed down in 10 minutes under an effective constant head of 40cm.
On oven drying the list specimen weighed 4.98N. Taking G = 2.65. Calculate the seepage velocity of water during test. **(10 Marks)**

Module-4

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

b. In a consolidation test a soil sample 20mm in thickness took 28m to reach 90% consolidation under two way drainage conditions for the same soil in the field. What would be the time taken in days for 50% and 90% consolidation. If the thickness of soil layer in 4m and if then i) On way drainage ii) Two way drainage. **(10 Marks)**

c. List the assumption of Terzaghi one dimensional consolidation theory. **(04 Marks)**

OR

8 a. With a help of neat sketch, explain determination of consolidation characteristic of soil by logarithm of time fitting method. **(10 Marks)**

b. In a consolidation test the void ratio decreased from 0.70 to 0.60. When pressure changed from 50kN/m^2 to 100kN/m^2. Determine: i) Compression Index ii) Co-efficient of permeability iii) Coefficient of volume change. **(10 Marks)**

Module-5

9 a. What are the factors affecting shear strength of soil? **(04 Marks)**

b. Explain with neat sketch, unconfined compression test. **(06 Marks)**

c. An unconfined compression strength of a soil is found to be 150kN/m^2. A sample of the same soil failed at a deviator stress of 200kN/m^2. When tested in a consolidated undrained triaxial compression test with a cell pressure of 50kN/m^2. Determine the shear strength of soil. **(10 Marks)**

OR

10 a. Write the advantage and disadvantages of direct shear test. **(04 Marks)**

b. A shear bore test is carried out and the following results are obtained:

Normal stress (kN/m^2)	200	250
Shear stress (kN/m^2)	100	125

i) Find shear parameters.

ii) What would be the deviator stress at failure if a triaxial test is carried out from the same soil with cell pressure of 100kN/m^2? **(10 Marks)**

c. Briefly explain the procedure for Direct shear test along with suitable figure. **(06 Marks)**

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