Total number of printed pages: 2 **UG/5th Semester/UCE505**

2022

GEOTECHNICAL ENGINEERING

Full Mark: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. a) What is density index or relative density in soil? Explain the experimental procedure for determining the relative density of soil. 5+5=10

   b) An embankment, having a total volume of 5000 m3 has a water content of 16% and dry density of 1.75 g/cm3. If it was constructed from a borrow pit where the undisturbed soil has a water content of 13% and void ratio of 0.6, calculate the quantity of soil which was excavated for the construction of the above embankment. Take specific gravity of soil solids as 2.68. 10

2. a) What are the different factors which effect the permeability of soil? Explain briefly the constant head and falling head permeability test. 4+6=10

   b) A horizontal stratified soil deposit consists of three uniform layers of thickness 6m, 4m and 12m respectively. The permeability of these layers are $8x10^{-4}$cm/s, $52x10^{-4}$cm/s, and $6x10^{-4}$ cm/s. Find the effective average permeability of the deposit in the horizontal and vertical direction. 10

3. a) State the various factors affecting compaction of soil 10

   b) A cohesive soil yields a maximum dry density of 1.8g/cc at an OMC of 16% during a standard proctor test. If the values of G is 2.65, what is the degree of saturation? What is the maximum dry density it can further compacted to? 10

4. a) What are the assumptions made in deriving Terzaghi's one dimensional consolidation theory. Explain any one method of determining pre-consolidation pressure. 5+5=10

b) (a) In a consolidation test, the void ratio of a soil sample decreases from 1.20 to 1.10 when the pressure is increased from 200 to 400 kN/m2. Calculate the coefficient of consolidation if the coefficient of permeability is 8.0×10^{-7} mm/sec. 10

5. a) Explain the advantages of tri-axial test over direct shear and unconfined compression test. 10

b) With suitable diagram explain differences between infinite and finite slope. Determine the factor of safety expression for purely cohesive soil using Swedish Circle method of analysis. 5+5=10

6. a) Derive the expression for Laplcae equation for a two dimensional flow. 10

b) What is flow net? Write down the properties of flow net. 4+6=10