Total number of printed pages: 1 **5th Semester/Diploma/DCE 503**

2024
(DECEMBER)

GEOTECHNICAL ENGINEERING

Full Marks: 100
Pass Marks: 30
Time: Three hours
The figures in the margin indicate full marks for the questions.
*Answer **all** questions.*

1) (a) What are the difference between compaction and consolidation? **5**

(b) Classify the soils **5**

(i) SP (ii) GM (iii) CH (iv) OL (v) MH

(c) In a falling head permeability test, the time taken for the head to fall from 27 cm to 3 cm is 10 min. If the test is repeated with the same initial head of 27 cm, what time would it take for the head to fall to 9 cm? **10**

2) (a) Describe Terzaghi's spring piston analogy for consolidation of soil. **10**

(b) The void ratio of clay is 1.56 and its compression index is found to be 0.8 at the pressure 180 kN/m^2. What will be the void ratio if the pressure is increased to 240 kN/m^2. Also determine coefficient of compressibility and coefficient of volume compressibility. **10**

3)(a) The results of a liquid limit test are given below. Draw flow curve and determine the liquid limit **10**

No. of blows	11	15	23	30	46	53
Water content	53.9	50.6	48.1	46.0	43.3	41.0

(b) Define compaction. What are the objectives of compaction? Describe the factors affecting compaction of soil. **2+3+5=10**

4)(a) Drained shear box tests were carried out on a series of soil samples with the following results

Total Normal stress (kPa)	Total shear stress at failure (kPa)
100	98
200	139
300	180
400	222

10

(b) Explain and deduce Darcy's law. What is the difference between seepage velocity and discharge velocity? Describe the constant head permeability test to determine coefficient of permeability of soil. **2+3+5=10**

5)(a) The total unit weight of glacial outwash soil is 6 KN/m^3. The specific gravity of solid particles of soil is 2.67. The water content of the soil is 17%. Calculate dry unit weight, porosity, void ratio and degree of saturation. Assume that unit weight of water is $10KN/m^3$ **10**

(b) Deduce the relation between void ratio (e) and porosity (n) by phase diagram **5**

(c) Describe with diagram about the fundamental building blocks of clay minerals **5**