Total No. of printed pages = 4

19/5th Sem/DCE503

2021

GEOTECHNICAL ENGINEERING

Full Marks – 100

Time – Three hours

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

Answer any *five* questions.

1. (a) What is permeability ? Discuss the various factors that affect the permeability of soil. 6

   (b) Write the difference between seepage velocity and discharge velocity. 4

   (c) The stresses during a triaxial test on a sample of soil are as follows :

   Major principal stress = 5 kg/cm^2 and Minor principal stress = 3 kg/cm^2.

   Draw the Mohr's circle and determine the state of stress on a plane inclined at 35^o with major plane. 10

[Turn over

2. (a) What do you understand by the term: Consolidation ? Describe Terzaghi's spring-dashpot model to explain the mechanism of consolidation. 10

(b) Following are the results of a compaction test.

Mass of soil +Wet soil(gm)	2695	3095	3159	3125	3070
Water content (%)	10	12	14.3	16.1	18.2

The volume of mold = 1000 cm^3, mass of mold = 1000 gm and G = 2.7.

Plot the compaction curve showing the OMC and MDD. 10

3. (a) Describe Standard Proctor test. 8

(b) An undisturbed sample obtained from field weighted 18N, with a volume of 1×10^{-3} m^3. The dry unit weight of the sample was 15.4 kN/m^3 and its specific gravity was 2.7. Determine (i) water content (ii) void ratio (iii) Degree of saturation. (Assume unit weight of water 10 kN/m^3) 12

4. (a) Distinguish between void ratio and porosity. Derive the relation between void ratio and porosity. 6

(b) Write the difference between compaction and consolidation. 4

(c) In a falling head permeability test, the initial head of 1.0m dropped to 0.35m in 3 hours. The diameter of the standpipe being 5 mm. The soil sample was 200 mm long and 100 mm wide. Determine the coefficient of permeability. 10

5. (a) Define principal plane and principal stresses of a soil element. 4

(b) Explain the basic structural units which clay minerals are made. 6

(c) The following results were obtained from the liquid limit test

No. of blows	55	46	32	22	15
Water content (%)	24	30	35	41	49

Find the liquid limit. If plastic limit of the soil is 24%, determine plasticity index. 10

6. (a) Differentiate between well graded and poorly graded soil. 2

(b) Soil deposits can be divided into how many classes in regards to consolidation history ? Define the classes. Define over consolidation ratio (OCR) and what are the OCRs for different classes of soil deposits ? 10

(c) What are the different states of consistency of a soil ? With a neat schematic graph explain the different states of soils at different water content. 8