PVP 20

Code: 20CE3402

II B.Tech - II Semester – Regular Examinations – JULY 2022

GEOTECHNICAL ENGINEERING
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

* Assume the suitable data as per Indian Standards *

UNIT – I

1. a) List out what are consistency limit and explain them in detail and also state their importance in geotechnical engineering. 7 M
   b) Draw 3-phase diagram and explain any seven soil properties in detail with their significance in geotechnical engineering. 7 M

OR

2. a) Explain Indian soil classification system in detail. 9 M
   b) The porosity of soil is 0.29, G_s of soil is 2.65, calculate saturated unit weight and also water content at when bulk density of soil is 18.8 kN/m^3. 5 M

UNIT – II

3. a) Explain factors effecting the permeability in detail. 5 M
   b) Describe quick sand condition and hydraulic gradient and also state an example when it will occur. 4 M
   c) Explain seepage pressure and piping in dams with a neat sketch. Also state the reasons for piping failure in dams. 5 M

OR

4. a) Evaluate total stress, pore water pressure and effective stress and draw diagrams for a given soil profile shown in Fig. 1 below. Consider capillary rise in second layer, assuming the diameter of the capillary tube as 0.003 cm.

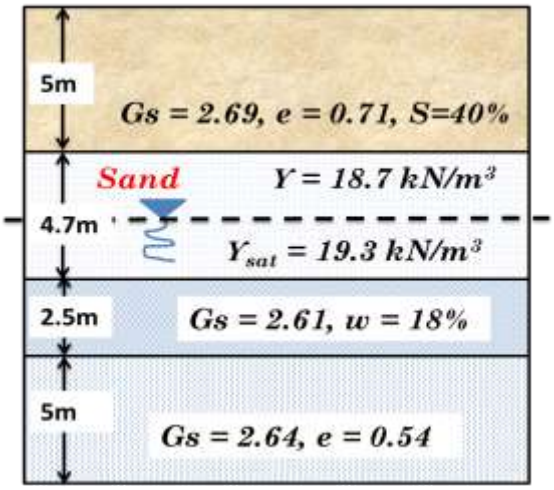

Fig. 1: Soil profile 7 M

b) A horizontal stratified soil deposit consists of four layers each uniform in itself. Soil profile with thickness of layers and necessary data is shown in Fig.2. Find the effective average permeability of the deposit in the horizontal and vertical directions.

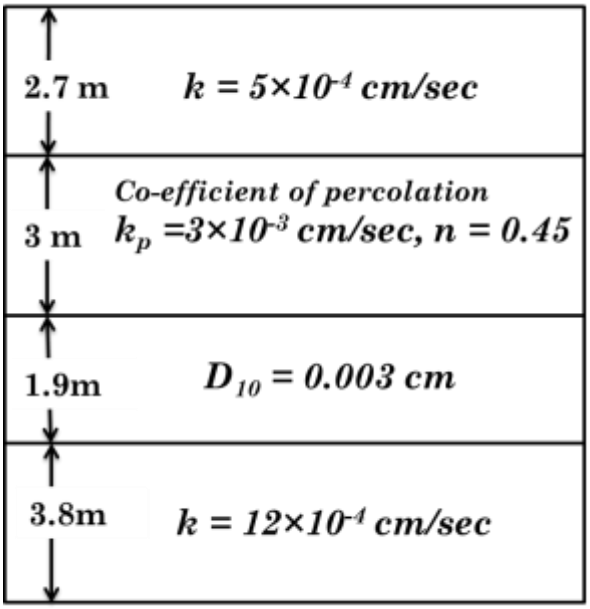

Fig.2: Profile of layered soil 7 M

UNIT-III

5. a) Explain Terzaghi one dimensional consolidation theory also state their assumptions. 5 M

   b) List out different consolidation coefficients and explain them in detail. 4 M

   c) Determine the OMC and maximum dry density of the soil from the standard soil compaction test (as per Indian Standard - light compaction) results as shown in below table. Also draw 10% and 20% air void line in Moisture vs. dry density curve .

S. No	Water content (%)	Moist weight (kN)
1	2.9	0.0178
2	4.6	0.0189
3	7	0.0202
4	9.1	0.0212
5	11.3	0.0219
6	13.4	0.0228
7	14.7	0.0224
8	15.8	0.0218

5 M

OR

6. a) Calculate the primary consolidation settlement at point A (Fig. 3). The foundation is resting on a clayey soil as shown below.

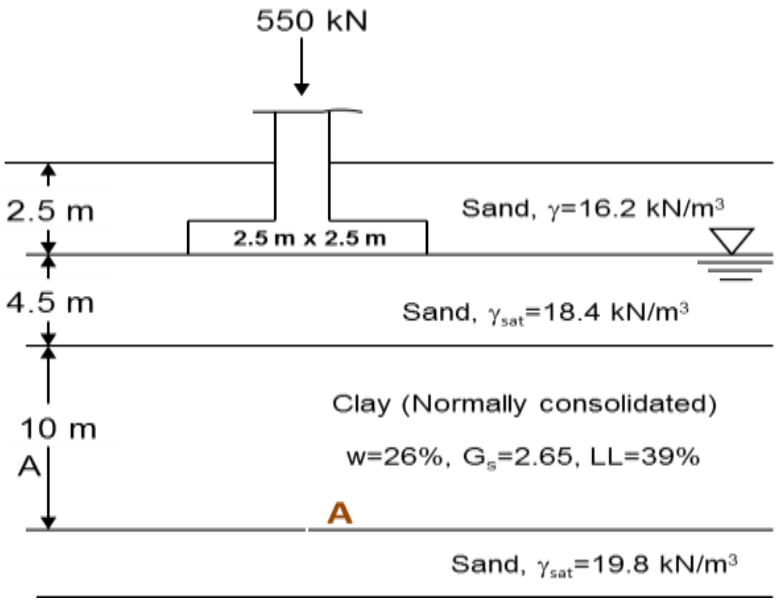

Fig.3: Soil profile 7 M

b) Explain principle and factors effecting the compaction in detail with a neat sketch. 7 M

UNIT – IV

7. a) Explain Unconfined compression test in detail with a neat sketch. 7 M

b) Calculate the potential shear strength on a horizontal plane at a depth of 3 m below the surface in a formation of cohesionless soil when the water table is at a depth of 3.5 m. The degree of saturation may be taken as 0.5 on the average. Void ratio = 0.50; grain specific gravity = 2.70; angle of internal friction = 30°. What will be the modified value of shear strength if the water table reaches the ground surface? 7 M

OR

8. a) Explain Mohr – coulomb shear strength failure theory. Describe any two laboratory methods for determining the shear strength parameters of sandy soil. 7 M

b) State limitations of direct shear test. The following data were obtained in a direct shear test. Normal pressure = 40 kN/m^2, tangential pressure = 30 kN/m^2. Angle of internal friction = 25°, cohesion = 15 kN/m^2. Represent the data by Mohr's Circle and compute the principal stresses and the direction of the principal planes. 7 M

UNIT – V

9. Explain material responses to normal loading and unloading Soderberg-GoodMan model in detail. 14 M

OR

10. Explain Boussinesq theory for the determination of vertical stresses due to point loads in detail. 14 M