R16

Code No: 136DV

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2019

SOIL MECHANICS

(Civil Engineering)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a) What are the Index properties of soil? [2]

b) The dry density of a sand with porosity of 0.387 is 1600 kg/m^3. Find the void ratio of the soil and the specific gravity of the soil solids. [Take γ_w = 1000 kg/m^3] [3]

c) Define neutral stress and effective stress. [2]

d) What is quick sand phenomenon? How would you calculate the hydraulic gradient required to create quick sand condition in a sample sand? [3]

e) What do you mean by pressure bulb? [2]

f) What are the assumptions made in Boussinesq's theory? [3]

g) Define normally consolidated and over consolidated soils. [2]

h) Briefly explain e-p and e-log p curves. [3]

i) What do you mean by Critical void ratio of sand? [2]

j) Draw the failure envelopes for an over-consolidated soil for the $\overline{CU}$ test and point out the important divergence from a normally consolidated soil. [3]

PART - B

(50 Marks)

2.a) The dry unit weight of a soil sample in the loosest state is 13.34 KN/m^3 and in the densest state, it is 21.19KN/m^3. Determine the relative density of the sand when it has porosity of 33%. Assume the grain specific gravity as 2.68.

b) Differentiate between Saturated density and Bulk density. [8+2]

OR

3.a) A soil has a porosity of 40%, the specific gravity of solids of 2.65 and water content of 12%. Determine the mass of water required to be added to 100 m^3 of this soil for full saturation.

b) What is relative density? How it is determined? What is its importance for coarse grained soil? [6+4]

4. What are the pumping out methods for the determination of coefficient of permeability in the field. What are their advantages and disadvantages? What are Dupuit's assumptions? [10]

OR

5.a) A sand deposit is 10m thick and overlies a bed of soft clay. The ground water table is 3m below the ground surface. If the sand above the ground water table has a degree of saturation of 45%, plot the diagram showing the variation of the total stress, pore water pressure and effective stress. The void ratio of the sand is 0.70. Take specific gravity (G) = 2.65. [6+4]

b) Explain the uses of Flow net.

6.a) With a sketch explain the construction of Newmark's chart.

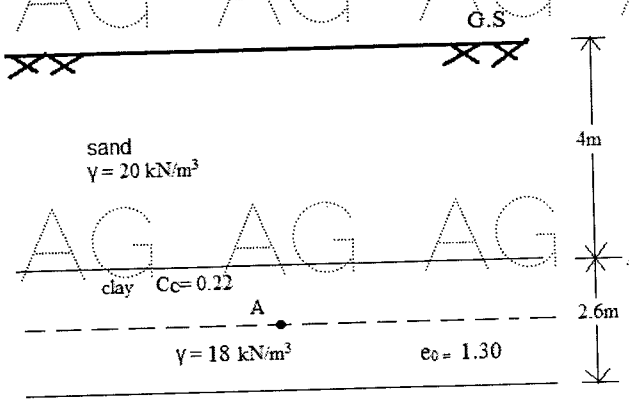
b) A line load of 100KN/m run extends to a long distance. Determine the intensity of vertical stress at a point 2m below the surface at a distance of 2m perpendicular to the line load. Use Boussinesq's theory. [6+4]

OR

7.a) What is field compaction? Briefly describe different methods of field compaction. [6+4]

b) Discuss on compaction quality control.

8.a) Calculate the final settlement of the clay layer shown in Fig.1 due to an increase of pressure of 30kN/m^2 at mid-height of the layer. Take $\gamma_w = 10$ kN/m^3. Also calculate the settlement when the water table rises to the ground surface. Where, C_c= compression Index ; e_o=Initial void ratio



b) Discuss the limitations of Terzaghi's theory of consolidation. Why is theory used despite its limitations? [6+4]

OR

9. A saturated soil stratum 4m thick lies above an impervious stratum and below a pervious stratum. It has void ratio of 1.50 at an initial pressure of 150 kN/m^3.
a) Compute the change in void ratio due to an increase of stress of 50 kN/m^3.
Take $C_c = 0.20$
b) Also compute the final settlement of the soil stratum due to above increase in stress.
c) What would be the time required for 50% consolidation?
Take $T_v = 0.20$, $k = 3.0 \times 10^{-4}$ cm/sec. [10]

10.a) Explain the types of shear test based on different drainage conditions.

b) Give one example each of the use of UU(Unconsolidated undrained) strength, CD (consolidated drained)strength in engineering practice. [6+4]

OR

11. A series of consolidate-undrained ($\overline{CU}$) triaxial tests was conducted on an over-consolidated clay and the following results were obtained.

Sample no.	Cell pressure (kN/m^2)	Deviator stress (kN/m^2)	Pore-water pressure (kN/m^2)
1	125	510	-70
2	250	620	-10
3	500	850	+120

Plot the strength envelopes in terms of total stresses and effective stresses, and hence determine the strength parameters. If the soil was pre-consolidated to a pressure of 1000 kN/m^2, plot the variation of the pore pressure parameter A_f with the over-consolidation ratio. [10]

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