RollNo. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, NOV/DEC 2021

CIVIL ENGINEERING
Semester IV
CE7403 & Soil Mechanics (Tamil)
(Regulation 2015)

Time:3 hours Max. Marks: 100

PART- A (10x2=20 Marks)

(Answer all Questions)

Q.No	Questions	Marks
1	How is the plasticity chart useful for classifying fine grained soil?	2
2	Differentiate Relative density and Relative compaction. Are these terms applicable to all soils?	2
3	In fine grained soils, what effects does the pressure of adsorbed water have on the co- efficient of permeability?	2
4	List any four properties that are determined by the construction of flownet.	2
5	Compare Boussinesq's and Westergaard's theory. Which theory gives higher vertical stress for a given depth? Why?	2
6	What is meant by isobar and pressure bulb?	2
7	What is meant by Liquefaction? How the factor of safety is determined?	2
8	When you will prefer field vane shear test and laboratory vane shear test? Why?	2
9	In slope stability analysis, lots of assumptions are made, what is the purpose of these assumptions.	2
10	List the various types of failures of finite slopes indicating the situations in which they are likely to occur.	2

PART- B (5x 13=65 Marks)

(Restrict to a maximum of 2 subdivisions)

Q.No	Questions	Marks
11 (a) (i)	A soil sample has unit weight of 16.97kN/m^3 and a void ratio of 0.84. The specific gravity of solids is 2.7. Determine the moisture content, dry unit weight of the sample.	4
(ii)	The Atterberg limits of a clay soil used for an earth dam are liquid limit 60%, plastic limit 40%, and shrinkage limit 25%. If a specimen of the soil of volume 10 cm^3 at the liquid limit has a volume 6.5 cm^3 when dried, would be the specific gravity of the soil particles.	9
(OR)		
11 (b) (i)	Discuss the physical properties and factors which are considered in any particular system of soil classification.	7
(ii)	How many cubic meters of fill can be constructed at a void ratio of 0.7 from 119000 m^3 of borrow material that has a void ratio of 1.23.	6
12 (a) (i)	Compute the critical hydraulic gradient for the following materials A) Coarse sand: k = 10 cm/sec; Gs = 2.67; e = 0.65 B) Sandy silt: k = 10^{-6} cm/sec; Gs = 2.67; e = 0.8 Discuss on the results.	5
(ii)	Explain the phenomenon of quick sand. What hydraulic head is required to create a quick sand condition in a non-cohesive soil sample of length =6 m,	8

<table>
<tr><td></td><td>void ratio = 0.65, G=2.65.</td><td></td></tr>
<tr><td colspan="3">(OR)</td></tr>
<tr><td>12 (b) (i)</td><td>A sand deposit contains four distinct horizontal layers of equal thickness. The hydraulic conductivity of the upper and lower layers is 10^{-3} cm/sec and middle layers are 10^{-2} and 10^{-4} respectively (second and third). What are the equivalent values of the horizontal and vertical hydraulic conductivities of the three layers, and what is their ratio?</td><td>8</td></tr>
<tr><td>(ii)</td><td>A sand deposit of 12 m thickness overlies a clay layer. The water table is 3 m List all the factors that affect the coefficient of permeability. Discuss in detail about any two factors.</td><td>5</td></tr>
<tr><td>13 (a)</td><td>A clay deposit of 5 m thick is covered with coarse sand at top and bottom and has a permeability of 0.025 m/yr. It is additionally loaded by a pressure of 65 kPa. Laboratory tests on the field specimen indicate that the consolidation in the field will be only 50% in a six months period. Find the settlement of the clay deposit in the one year.</td><td>13</td></tr>
<tr><td colspan="3">(OR)</td></tr>
<tr><td>13 (b) (i)</td><td>Brief the procedure of construction of Newmark’s influence chart and its use to determine the stress at a point.</td><td>7</td></tr>
<tr><td>(ii)</td><td>A column of a building transfers a concentrated load of 250 kN to the soil in contact with the footing. Estimate the vertical pressure at a radial distance of 5 m and at a depth of 5 m.</td><td>6</td></tr>
<tr><td>14 (a)</td><td>A direct shear test conducted on identical soil specimen give the following results.

<table><tr><td>Normal stress (kN/m^2)</td><td>50</td><td>40</td></tr><tr><td>Shear stress (kN/m^2)</td><td>100</td><td>70</td></tr></table>
Determine the shear strength parameters. If an undrained triaxial test, that was conducted on the same soil and at same density and water content with a cell pressure of $75kN/m^2$, estimate the deviator stress at the failure.</td><td>13</td></tr>
<tr><td colspan="3">(OR)</td></tr>
<tr><td>14 (b)</td><td>Two sets of triaxial tests were carried out on two samples of glacial silt. The results are
(a) σ_1= 400 kN/m^2, σ_3= 100 kN/m^2
(b) σ_1= 680 kN/m^2, σ_3= 200 kN/m^2
The angle of failure plane in both tests was measured to be 59^0. Determine the shear strength parameters.</td><td>13</td></tr>
<tr><td>15 (a)</td><td>Brief the friction circle method of analysis of finite slope of c-φ soil.</td><td>13</td></tr>
<tr><td colspan="3">(OR)</td></tr>
<tr><td>15 (b)</td><td>From fundamentals, device the equation of factors of safety of infinite slope of c-ϕ soil. From this deduce the factors of safety equation of cohesive soil and non-cohesive soil slopes with seepage.</td><td>13</td></tr>
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PART- C(1x 15=15Marks)

(Q.No. 16 is Compulsory)

Q.No	Questions	Marks
16 (i)	What is meant by significant depth? How it is related to isobar? What is the approximate significant depth for a square and strip footing? In a project clear space between two square footings is less than B/4, because of certain limitations, How this space will change the significant depth. Discuss with neat diagram. B is the width of the footing.	9
(ii)	An area is underlain by a stratum of clay layer 6 m thick. The layer is doubly drained and has a coefficient of consolidation of 0.3 m^2/month. Determine the time required for a surcharge load to cause a settlement of 400 mm if the same load cause final settlement of 600 mm.	6