VIT

Vellore Institute of Technology

SCHOOL OF CIVIL ENGINEERING

Continuous Assessment Test - I, August 2019

B. Tech. *(Civil Engineering)*, Fall Semester 2019–20

Class Nbr.	: VL2019201003699		
Course Code	: CLE1004	**Duration**	: 90 Minutes.
Course Name	: Soil Mechanics and Foundation Engineering	**Max. Marks**	: 50
Faculty-In-Charge:	Dr. Divya Priya B	**Slot**	: E1+TE1

General instruction(s):

Use of IS: 1498-1970 Plasticity Chart is permitted

Assume values wherever necessary

Answer all questions

Section – A (5 x 2 = 10 Marks)

1. Why void ratio is more favoured for use in soil engineering compared to porosity though both express the proportion of volume of voids?
2. Estimate the capillary rise in a soil with a void ratio of 0.65 and effective size of particle is 0.07 mm. Take $C = 10\ mm^2$.
3. What are the factors affecting compaction?
4. Atterberg limit tests were carried out on a soil sample, with the following results: Liquid limit = 40%; Plastic limit = 25%. Classify the soil according to the Indian Standard classification system.
5. Why is there more likelihood of quick condition in sands than in clays?

Section – B (4 x 10 = 40 Marks)

1. a) A cylinder contains $1 \times 10^{-3}\ m^3$ of loose dry sand which weighs 15 N. The specific gravity of solids can be taken as 2.70. A static load of 200 kN/m^2 is applied to the sand, and the volume is reduced by 1.5%. When the sand is vibrated, the volume is reduced by 10% of the original volume. Compute the dry unit weight and void ratio corresponding to (i) loose state, (ii) under static load and (iii) under vibration.

[6 marks]

[P.T.O]

b) A clay soil sample has a liquid limit of 50% and plastic limit of 20% with 30% of particles finer than 2μ by its weight. The unconfined compression strength of the above soil sample in undisturbed state and after remoulding is 180 kN/m^2 and 18 kN/m^2 respectively. Classify the soil with respect to its Activity and Sensitivity.

[4 marks]

2. A soil in the borrow pit is at a dry density of 17 kN/m^3 with a moisture content of 10%. The soil is excavated from this pit and compacted in an embankment to a dry density of 18 kN/m^3 with a moisture content of 15%. Compute the quantity of soil to be excavated from the borrow pit and the amount of water to be added for 100 m^3 of compacted soil in the embankment. **[10 marks]**

3. a) A constant-head permeability test conducted in a soil sample yields the following data: Diameter of the permeameter = 7.5 cm; head lost over a sample length of 18 cm = 24.7 cm; quantity of water collected in 60 s = 626 ml; porosity of the soil sample = 44%. Determine the (a) coefficient of permeability of the soil (b) discharge velocity, and (c) seepage velocity **[6 marks]**

b) In a deposit of fine sand of about 8 m, the water table is 3.5 m below the surface, but sand to a height of 1.0 m above the water table is saturated by capillary water; above this height, the sand may be assumed to be dry. The saturated and dry unit weights, respectively, are 20 and 16 kN/m^3. Calculate and plot the effective, neutral and total vertical stress in the sand deposit to a depth of 8 m below the surface. **[4 marks]**

4. A stratified soil deposit made up of three horizontal strata with the details are as follows:

Layer No.	Thickness	Coefficients of permeability (cm/s)
1	$H_1 = 2$ m	5×10^{-4}
2	$H_2 = 5$ m	2×10^{-2}
3	$H_3 = 3$ m	3×10^{-3}

Determine the average horizontal and vertical coefficients of permeability and their ratio for a soil deposit. Assuming an average hydraulic gradient of 0.3 in both horizontal and vertical seepage, find (i) discharge value and discharge velocities in each layer for horizontal flow, and (ii) hydraulic gradient and loss in head in each layer for vertical flow.

[10 marks]

[P.T.O]