U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E.
Branch: Civil Engineering
Course Code: 23CV4PCGTE
Course: Geotechnical Engineering-I

Semester: IV
Duration: 3 hrs.
Max Marks: 100

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

				CO	PO	Marks
			UNIT – I			
1	a)		Show the phase diagram for dry soil, saturated soil and partially saturated soil with usual notations	CO 1	PO1	04
	b)		Define the following with the help of a phase diagram a) Void ratio b) Air content c) Porosity d) Percentage air void	CO 1	PO1	08
	c)		An embankment is to be constructed with a void ratio of 0.85 and quantity of embankment being 5000m³. Three borrow pits are available for the construction of the embankment and the corresponding void ratio and the cost of transportation for 1m³ of soil given below. Determine the most economical borrow pit	CO 1	PO2	08
			UNIT – II			
2	a)		Discuss the corrections applied to hydrometer readings	CO 1	PO1	06
	b)		List the field identification of soil and explain any two	CO 1	PO1	04
	c)		The following data were obtained from a liquid limit test	CO 1	PO2	10

Question 1c) table:

Borrow pit	Void ratio	Cost/m³ in Rs.
A	0.95	30
B	1.90	16
C	1.65	25

Question 2c) table:

No. of blows	28	26	17	13
Water Content (%)	105.1	105.7	110.9	112.2

Two plastic limit determinations gave water content of 34.5% and 35.2%. Plot the flow curve. Determine liquid limit, plasticity index, flow index, toughness index. Assume G=2.80 and calculate the void ratio of the saturated soil at liquid limit and plastic limit.

				OR			
	3	a)		Explain IS soil classification system by sketching the Plasticity chart	*CO 1*	*PO1*	**10**
		b)		To what depth will particle of 0.1mm and 2 microns diameter reach in 1 hour in an equal suspension at a temperature of 28ºC? Determine the time required for a particle of 5 microns diameter to settle at a depth of 100mm at temperature 28ºC and $\eta=8.52 \times 10^{-6}$ g-sec/cm^2. Take $\gamma_w = 0.996$g/cc and G =2.70	*CO 1*	*PO2*	**10**
				UNIT - III			
	4	a)		Briefly explain the following a) Kaolinite Clay Mineral b) Cation Exchange Capacity c) Adsorbed water and structural water d) Capillary rise in soils e) Flocculated structure	*CO 2*	*PO1*	**10**
		b)		A soil deposit 8m thick has bulk unit weight of 20kN/m^3, if the water table is at a depth of 3m below ground surface and soil above water table is saturated by capillary water. Plot the effective stress, pore pressures and total stress diagrams for the entire depth of 8m	*CO 2*	*PO2*	**10**
				UNIT – IV			
	5	a)		Discuss the factors affecting the compaction properties of the soil	*CO 2*	*PO1*	**06**
		b)		Discuss the effects of compaction on the soil properties	*CO 2*	*PO1*	**06**
		c)		In a falling head permeability test the soil sample used is 20cm long with a cross sectional area of 24cm^2. Calculate the time required for the head causing flow to drop from 250mm to 120mm. The area of c/s of the stand pipe is 2cm^2. The sample is made up of 3 layers, the thickness of the first layer from the top 8cm and its has a value of k as 2 x 10^{-4}cm/s, the second layer has a thickness of 7cm and it has a value of k as 5 x 10^{-4} cm/s, the third layer has a thickness of 5cm and it has a value of 7 x 10^{-4} cm/s. Flow is in a direction perpendicular to the layers.	*CO 2*	*PO1*	**08**
				OR			
	6	a)		Discuss the factors affecting permeability of soils	*CO 2*	*PO1*	**06**
		b)		Differentiate between coefficient of permeability and coefficient of percolation	*CO 2*	*PO1*	**04**

		b)	The following data refers to IS light compaction test in a cylindrical mould of capacity 1000ml.	CO 2	PO2	**10**

Water Content (%)	10	12	14.3	16	18.3
Weight of wet sample (N)	19.63	21.37	21.93	21.68	21.14

			Specific gravity of solids is 2.70. Plot the compaction curve and obtain maximum dry unit weight and optimum moisture content. Plot zero air void line and 80% saturation line.			
			UNIT – V			
7	a)		Discuss the factors affecting the shear strength of cohesion less soils and cohesive soils separately	CO 2	PO1	**10**
	b)		Two identical specimens were tested in a triaxial apparatus test. Specimen failed at a deviator stress of $770kN/m^2$ and cell pressure was $200kN/m^2$. Second specimen failed at a deviator stress of $1370kN/m^2$ and cell pressure of $400kN/m^2$. Determine c and phi analytically. If on the same sample a direct shear test was conducted under normal stress of 600kPa, estimate the shear stress at failure.	CO 2	PO2	**10**

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