B.M.S. College of Engineering, Bengaluru - 560 019

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E.   **Semester: IV**
Branch: Civil Engineering   **Duration: 3 hrs.**
Course Code: 19CV4PCGTE   **Max Marks: 100**
Course: Geotechnical Engineering - I

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

				CO	PO	Marks
			UNIT - I	**CO**	**PO**	**Marks**
1.		a.	For a completely saturated soil using phase diagram from first principles derive a phase interrelationship relating total unit weight of soil, specific gravity, degree of saturation, void ratio and unit weight of water.	CO1	PO1	**06**
		b.	List different types of transported soils and the agency which transports them. Explain the characteristic feature of aeolian deposits.	CO1	PO1	**06**
		c.	In its natural condition, a soil sample has a mass of 2280 g and a volume of $1.14 \times 10^{-3} m^3$. After being completely dried in an oven, the mass of the sample is 2029gms. The value of G for the soil is 2.67. Determine the bulk density, bulk unit weight, water content, void ratio, porosity, degree of saturation and air content.	CO2	PO2	**08**
			UNIT - II			
2.		a.	With the help of particle size distributions, define the following: (i)Well graded soils (ii) Poorly graded soils (iii) Gap graded soils.	CO1	PO1	**10**
		b.	State Stoke's law. List the assumptions and limitations of Stoke's law as applied to soil sedimentation.	CO1	PO1	**10**
			OR			
3.		a.	Briefly explain shrinkage limit test on soils.	CO1	PO1	**06**
		b.	Explain IS soil classification of soils in detail.	CO1	PO1	**06**
		c.	A core cutter of 100mm internal diameter and 128mm height was used to determine the unit weight of soil at a site. The total weight of core cutter and soil was 3015gms and empty weight of core cutter was 1374gms. A representative sample of soil was kept in a steel cup of weight 60gms for the determination of water content. Weights of cup and soil before and after placing in oven were respectively 106.4gms and 92gms. Find dry unit weight of soil and degree of saturation, if G = 2.70.	CO2	PO2	**08**
			UNIT - III			
4.		a.	List the three most common clay minerals of engineering significance. With a neat sketch describe one clay mineral which if present in the soil causes swelling in the presence of moisture.	CO1	PO1	**08**

				CO	PO	Marks
	b.	The soil profile at a certain site contains sand to a depth of 9m below ground level with an impermeable layer below it. Water table is present at a depth of 5m below the ground level. There is a capillary rise of 1.1m above the GWT, but the capillary zone is partly saturated with a degree of saturation of 60%. The properties of the sand are Porosity = 37.5%. Specific gravity, Gs = 2.65. Determine total stress, pore water pressure and effective stress over the depth of deposit. Tabulate the results. Plot the variation of total stress, pore water pressure and effective stress over the depth of deposit.	CO2	PO2	**12**
		UNIT - IV			
5.	a.	List factors affecting compaction. Explain any two important factors.	CO1	PO3	**06**
	b.	In a falling head test, if the time interval for drop in levels from h1 to h2 and from h2 to h3 are equal, find the relation between h2, h3 and h1.	CO1	PO3	**06**
	c.	A soil deposit consists of three layers 2m, 4m, 3m thick with permeability 10^{-4}m/s, 10^{-5}m/s, 10^{-6}m/s respectively. Calculate horizontal and vertical permeability. Find the ratio of horizontal to vertical permeability.	CO2	PO2	**08**
		OR			
6.	a.	Explain with neat sketches the effect of compaction on: i) Shear strength and ii) Soil structure.	CO1	PO1	**06**
	b.	Derive a relation between seepage velocity and discharge velocity. Also determine the relation between coefficient of permeability and coefficient of percolation.	CO1	PO1	**06**
	c.	Differentiate between standard and modified proctor tests.	CO1	PO1	**08**
		UNIT - V			
7.	a.	Discuss different drainage conditions to determine the shear strength parameters in the laboratory.	CO1	PO1	**06**
	b.	Derive a relationship between principal stresses at failure and shear parameters.	CO1	PO1	**06**
	c.	Explain the merits and demerits of direct shear test.	CO1	PO1	**08**

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