U.S.N.										

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

Autonomous Institute Affiliated to VTU

September / October 2024 Supplementary Examinations

Programme: B.E. **Semester: IV**
Branch: Civil Engineering **Duration: 3 hrs.**
Course Code: 22CV4PCGTE **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.

			UNIT - I	CO	PO	Marks
1	a)		Define the terms: i) True specific gravity ii) Apparent specific gravity iii) Relative density iv) Degree of saturation	CO1	PO1	**08**
	b)		With help of a phase diagram, define the terms bulk density, dry density and saturated density	CO1	PO1	**06**
	c)		A sample of saturated soil has a water content of 35%. The specific gravity of solids is 2.65. Determine its void ratio, porosity and saturated unit weight.	CO1	PO2	**06**
			UNIT - II			
2	a)		Discuss the field tests to identify silts from clays.	CO1	PO1	**04**
	b)		Briefly explain, how soils are classified according to Indian Standard (IS) classification system.	CO1	PO1	**08**
	c)		A sand replacement test was carried out to determine the in-situ bulk density of a soil. From the following recorded data, determine the value of density required. Mass of soil removed from hole = 2764g Initial total mass of sand pouring cylinder = 5724g Final total mass of sand pouring cylinder = 3172g Volume of cone in sand pouring cylinder = 248 cc Density of pouring sand = 1560 kg/m^3	CO1	PO2	**08**
			OR			
3	a)		Define the following: i) Plastic limit ii) Shrinkage limit	CO1	PO1	**04**

	b)	Determine the uniformity co-efficient and co-efficient of curvature of the soil, by plotting the grain size distribution curve for the following data. Sieve size (mm): 4.75, 2.36, 1.18, 0.600, 0.425, 0.300, 0.150, 0.075 Mass of soil retained (g): 167, 140, 160, 142, 118, 83, 72, 51	CO1	PO2	**08**
	c)	The dry unit weight of a sand sample in the loosest state is 13.34 kN/m^3 and in the densest state, it is 21.19 kN/m^3. Determine the density index of this sand when it has a porosity of 33%. Assume the grain specific gravity as 2.68.	CO1	PO2	**08**
		UNIT - III			
4	a)	List and discuss the types of soil structure.	CO2	PO1	**06**
	b)	A sediment settling lagoon has a depth of water of 4m above the clay base. The clay layer is 3m thick and this overlies 4m of a medium sand, which in turn overlies impermeable rock. Calculate the effective stresses at the top of the clay and at the top and bottom of the second layer under the following conditions: (a) Initially, before any sediment is deposited (b) after a 2m layer of sediment of silty fine sand has been deposited and (c) after draining the lagoon down to base level, with the same thickness (2m) of sediment still in place. Unit weights of clay=18kN/m^3; sand=20kN/m^3; sediment = 16kN/m^3.	CO2	PO2	**14**
		UNIT - IV			
5	a)	Discuss the factors affecting compaction of soil.	CO2	PO1	**10**
	b)	A stratified soil consists approximately of alternating layers of sand and silt. The sand layers are generally 150mm in thickness and have a permeability of k=6.5x10^{-1} mm/s, the silt layers are 1.80m thick and have a k=2.5x10^{-4} mm/s. Assuming that within each layer flow condition is isotropic, determine the ratio of the horizontal permeability to that of the vertical.	CO2	PO2	**10**
		OR			
6	a)	List the factors affecting permeability of soil.	CO2	PO1	**04**
	b)	Explain with neat sketch Proctor needle method for field compaction control.	CO2	PO1	**08**
	c)	The observations of a standard proctor test are given below: Water content (%): 10, 12, 14.3, 16.1, 18.2 Mass of wet soil (g): 1925, 2095, 2150, 2125, 2070 Volume of the mould used was 945 ml Plot the compaction curve Determine OMC and MDD. Also plot the ZAV considering G=2.7	CO2	PO2	**08**

<table>
<tr><td></td><td></td><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td></td><td>7</td><td>a)</td><td>Explain the advantages and disadvantages of
1. Triaxial test
2. Direct Shear test</td><td>CO2</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>A drained triaxial compression test carried out on three specimens of the same soil yielded the following results:
<table><tr><td>Test No.</td><td>1</td><td>2</td><td>3</td></tr><tr><td>Cell pressure (kPa)</td><td>100</td><td>200</td><td>300</td></tr><tr><td>Ultimate deviator stress (kN/m^2)</td><td>210</td><td>438</td><td>644</td></tr></table>
Draw the shear strength envelope and determine the shear strength parameters, assuming that the pore pressure remains constant during the axial loading stage.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
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