U.S.N.										

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

Autonomous Institute Affiliated to VTU

July / August 2024 Semester End Main 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.

		UNIT – I	*CO*	*PO*	Marks
1	a)	Define the term a)Degree of Saturation b)Percentage air voids c)Saturated density d)Mass specific gravity	*CO* 1	*PO1*	**8**
	b)	Derive the relationship between dry unit weight, specific gravity, water content and percentage air voids	*CO* 2	*PO1*	**6**
	c)	A soil sample in its undisturbed state was found to have volume of 105cm^3 and mass of 201g. After oven drying the mass got reduced to 168g. Compute i) water content ii) void ratio iii) Dry density	*CO* 2	*PO2*	**6**
		UNIT – II			
2	a)	List and discuss the tests involved in field identification of soils.	*CO* 1	*PO1*	**10**
	b)	Particles of five different sizes are mixed in the proportions shown in the following table and enough water is added to make 1000cc of suspension.	*CO* 2	*PO2*	**10**

Particle Size in mm	Mass in grams
0.050	6
0.020	20
0.010	15
0.005	5
0.001	4

It is ensured that the suspension is thoroughly mixed so as to have a uniform distribution of the particles. Take G=2.7 and η=0.01poise,find
i) Size of largest particle still in suspension at depth 6cm, 5minutes after start of sedimentation.
ii)The specific gravity of suspension at depth 6cm 5minutes after start of sedimentation.
iii)The time interval in which all the particles will have settled below 6cm.

			OR			
	3	a)	The liquid limit and plastic limit of soil are 34% and 26% respectively. When the soil is dried from its state at liquid limit to dry state the reduction in volume was found to be 35% of its volume at liquid limit. The corresponding volume reduction from the state of plastic limit to dry state was 25%of its volume at plastic limit. Calculate i) Shrinkage limit and ii) Shrinkage ratio.	***CO*** 2	***PO2***	**10**
		b)	What is consistency of soil? Discuss with relevant sketch the following in terms of soil consistency: i) Liquid limit ii) Plastic Limit iii) Shrinkage Limit.	***CO*** 1	***PO1***	**10**
			UNIT - III			
	4	a)	Distinguish between the Flocculated and Dispersed Structure	***CO*** 1	***PO1***	**4**
		b)	Explain the terms : Effective Stress, Pore Pressure and Total Stress	***CO*** 1	***PO1***	**6**
		c)	In a site reclamation project, 2.5m of graded fill(γ_d =22kN/m^3) Were laid in compacted layers over an existing layer of silty clay (γ_d =18kN/m^3) which was 3m thick. This was underlain by a 2m thick layer of gravel(γ_d =20kN/m^3).Assuming that the water table remains at the surface of the silty clay draw the effective stress profiles for case i) Before the fill is placed and case ii) After the fill has been placed	***CO2***	***PO2***	**10**
			UNIT – IV			
	5	a)	Discuss the factors affecting permeability of soil	***CO*** 1	***PO1***	**8**
		b)	To show that average permeability parallel to bedding plane is greater than that perpendicular to bedding plane, consider for example, three layers with thickness Z_1,Z_2,Z_3 and permeabilities k_1,k_2,k_3 let us assume Z_1=2units, Z_2=6units, Z_3=4units and k_1=5units, k_2=3units, k_3=7units.	***CO***2	***PO2***	**4**
		c)	Calculate the coefficient of permeability of a soil sample 6cm in height and 50cm^2 in cross sectional area, if a quantity of water equal to 430cc passed down in 10minutes under an effective constant head of 40cm. On oven drying, the test specimen weighed 4.98N.Taking G=2.65, calculate the seepage velocity of water during the test.	***CO2***	***PO2***	**8**
			OR			
	6	a)	Differentiate between Standard Proctor and Modified Proctor test.	***CO*** 1	***PO1***	**4**

<table>
<tr><td></td><td></td><td>b)</td><td>List and explain the factors affecting compaction.</td><td>CO 1</td><td>PO1</td><td>6</td></tr>
<tr><td></td><td></td><td>c)</td><td>The following observations were made in a Standard Proctor Test.
<table>
<tr><td>Trial No.</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Mass of wet soil(kg)</td><td>1.70</td><td>1.89</td><td>2.03</td><td>1.99</td><td>1.96</td><td>1.92</td></tr>
<tr><td>Water Content (%)</td><td>7.7</td><td>11.5</td><td>14.6</td><td>17.5</td><td>19.7</td><td>21.2</td></tr>
</table>
Volume of mould =945cc, G=2.67
Determine maximum dry density and optimum moisture content. Also plot zero air voids line.</td><td>CO2</td><td>PO2</td><td>10</td></tr>
<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>List the advantages of direct shear test and triaxial compression test</td><td>CO 1</td><td>PO1</td><td>4</td></tr>
<tr><td></td><td></td><td>b)</td><td>Explain Mohr-Coulomb failure theory.</td><td>CO 1</td><td>PO1</td><td>6</td></tr>
<tr><td></td><td></td><td>c)</td><td>The following table gives data obtained from triaxial compression test conducted under undrained conditions on two specimens of soil sample. The diameter and height are 40mm and 80mm respectively for both samples.
<table>
<tr><td>Specimen No.</td><td>1</td><td>2</td></tr>
<tr><td>Cell pressure (kN/m^2)</td><td>100</td><td>200</td></tr>
<tr><td>Deviator load at failure(N)</td><td>637</td><td>881</td></tr>
<tr><td>Increase in volume at failure(ml)</td><td>1.1</td><td>1.5</td></tr>
<tr><td>Axial compression(mm)</td><td>5</td><td>7</td></tr>
</table>
Find the shear parameters by analytical method</td><td>CO2</td><td>PO2</td><td>10</td></tr>
</table>

****