U.S.N.										

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

Autonomous Institute Affiliated to VTU

August 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			
1	a)	Differentiate between residual soils and transported soil with examples	*CO* 1	*PO1*	**04**
	b)	The dry unit weights of a sand in the loosest and densest state are respectively 1.36 and 2.18g/cc. Assuming the specific gravity of solids as 2.67, determine the relative density of sand with porosity of 30%	*CO* 2	*PO2*	**08**
	c)	A partially saturated soil sample obtained from an earth fill has a moisture content of 22% and bulk unit weight of 2g/cc. Assuming specific gravity of solids as 2.7 and density of water as 1g/cc, compute i. degree of saturation ii. void ratio iii. if subsequently the soil gets saturated, determine its unit weight	*CO* 2	*PO2*	**08**
		UNIT – II			
2	a)	The following observations were obtained from a liquid limit test of a soil No. of blows (N): 10 | 20 | 31 | 40 Water content (w): 82.0% | 74.3% | 68.0% | 65.0% Two tests for plastic limit were also performed, which gave values of 28.0% and 29.0% respectively. i. Plot the flow curve and ii. Determine the liquid limit, plasticity index, flow index and toughness index	*CO* 2	*PO2*	**12**
	b)	Discuss the various field identification tests	*CO* 1	*PO1*	**08**
		OR			

	3	a)	The following table gives the results of the particle size analysis, performed on 3 different soil samples A, B and C.	***CO*** 2	***PO2***	**14**

% Finer	Diameter of particles in mm		
	Soil A	Soil B	Soil C
90	1.20	0.075	0.0017
80	0.30	0.068	0.0011
70	0.15	0.062	0.00072
60	0.043	0.056	0.00050
50	0.019	0.050	0.00036
40	0.009	0.045	0.00030
30	0.0045	0.040	0.00023
20	0.0022	0.029	0.00016
10	0.0012	0.020	0.00011

The following additional data has been obtained for the above mentioned samples:

Soil	Liquid limit (%)	Plastic limit (%)
A	31	27.1
B	52	35
C	22	Non Plastic

Plot the grain size distribution curves, and classify the soils A, B and C according to IS classification system. What percentage of gravel, sand, silt and clay are present in each soil.

	b)	What are the assumptions and limitations of Stoke's law ?	***CO*** 1	***PO1***	**06**
		UNIT - III			
4	a)	Discuss the major clay minerals with neat sketches	***CO*** 1	***PO1***	**12**
	b)	The water table in an area is 5m below the natural ground level. The ground strata consists of a soil of very fine sand having an average void ratio of 0.65 up to 13m depth. Above the water table, the sand has an average degree of saturation of 50%. Calculate the effective stress on a horizontal plane at a depth of 11m below the ground level. What will be this effective stress and increase in stress if the soil gets saturated by capillarity up to a height of 1m above the water table. Assume G = 2.65	***CO*** 2	***PO2***	**08**
		UNIT – IV			
5	a)	A horizontal stratified soil deposit consists of three layers, each uniform in itself. The permeabilities of the layers are 8×10^{-4} cm/s, 50×10^{-4} cm/sand 15×10^{-4} cm/s; and their thicknesses are 6m, 3m and 12m respectively. Find the effective average permeability of the deposit in horizontal and vertical directions.	***CO*** 2	***PO2***	**08**
	b)	What are the effects of compaction on the soil properties	***CO*** 1	***PO1***	**06**

<table>
<tr><td></td><td></td><td>c)</td><td>Discuss the factors affecting permeability of soil</td><td>CO 1</td><td>PO1</td><td>06</td></tr>
<tr><td></td><td></td><td></td><td>OR</td><td></td><td></td><td></td></tr>
<tr><td></td><td>6</td><td>a)</td><td>A sand sample is tested in a constant head permeameter 11.7cm high and 10.2 cm in diameter. The quantity of water passing through the sample under an effective head of 10cm, for a period of 90 seconds was measured to be 600ml. Determine the coefficient of permeability.</td><td>CO 2</td><td>PO2</td><td>06</td></tr>
<tr><td></td><td></td><td>b)</td><td>A Proctor compaction test was conducted on a soil sample, and the following observations were made:
<table>
<tr><td>Water content (%)</td><td>8</td><td>11.5</td><td>14.5</td><td>17.5</td><td>19.5</td><td>21.5</td></tr>
<tr><td>Weight of wet soil (kg)</td><td>1.70</td><td>1.90</td><td>2.00</td><td>1.98</td><td>1.95</td><td>1.92</td></tr>
</table>
If the volume of the mould used was 950cc and the specific gravity of the soil was 2.65,
i. Draw the dry density vs. Moisture content curve
ii. Also plot the 100% and 80% saturation lines
iii. Find the maximum dry density and optimum moisture content
iv. Also find the degree of saturation at OMC</td><td>CO 2</td><td>PO2</td><td>14</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>Explain triaxial shear test with different drainage conditions</td><td>CO 1</td><td>PO1</td><td>10</td></tr>
<tr><td></td><td></td><td>b)</td><td>Undrained triaxial compression tests are carried out to failure on three specimens of clayey silt, with pore pressure measurements as shown below
<table>
<tr><th>Specimen No.</th><th>Major principal stress (kg/cm^2)</th><th>Minor principal stress (kg/cm^2)</th><th>Pore pressure (kg/cm^2)</th></tr>
<tr><td>1</td><td>1.57</td><td>0.17</td><td>0.12</td></tr>
<tr><td>2</td><td>2.04</td><td>0.44</td><td>0.20</td></tr>
<tr><td>3</td><td>2.25</td><td>0.55</td><td>0.22</td></tr>
</table>
By solving analytically
i. Determine the shear parameters constituting the shear strength of the soil
ii. Also determine how much increase or decrease in these parameters would be computed if the pore pressures were neglected</td><td>CO 2</td><td>PO2</td><td>10</td></tr>
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