Model Question Paper -1 with effect from 2020-21(CBCS Scheme)

USN | | | | | | | | | | |

Fifth Semester B.E. Degree Examination

Basic Geotechnical Engineering

TIME: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.

<table>
<tr><th colspan="3">Module – 1</th><th></th></tr>
<tr><td rowspan="3">Q.1</td><td>(a)</td><td>Define the following with the help of three phase diagram.
i) Air content
ii) Specific Gravity
iii) Water content
iv) Degree of Saturation</td><td>08</td></tr>
<tr><td>(b)</td><td>With usual notations prove that eS = wG</td><td>06</td></tr>
<tr><td>(c)</td><td>A soil has been compacted in an embankment, at a bulk unit weight of 21.5kN/m^3 and water content of 12%. Taking G = 2.65, calculate dry density, void ratio, degree of saturation and air content.</td><td>06</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="3">Q.2</td><td>(a)</td><td>Explain determination of in – situ density of soil by sand replacement method.</td><td>08</td></tr>
<tr><td>(b)</td><td>Define Liquid limit, plastic limit and Shrinkage limit</td><td>06</td></tr>
<tr><td>(c)</td><td>The following results refer to a liquid limit test:
<table><tr><td>No of blows</td><td>33</td><td>23</td><td>18</td><td>11</td></tr><tr><td>Water content (%)</td><td>41.5</td><td>49.5</td><td>51.5</td><td>55.6</td></tr></table>The plastic limit is 23.5%. Determine the plasticity index and toughness index</td><td>06</td></tr>
<tr><td colspan="3">Module – 2</td><td></td></tr>
<tr><td rowspan="2">Q.3</td><td>(a)</td><td>With sketch explain the common clay minerals</td><td>08</td></tr>
<tr><td>(b)</td><td>In a Standard Proctor test the mould of 1liter capacity weighs 12.5N when empty. Successive trials gave the following results:
<table><tr><td>Weight of mould + wet soil (N)</td><td>29.6</td><td>30.1</td><td>31.5</td><td>31.2</td><td>30.8</td></tr><tr><td>Water content (%)</td><td>16.7</td><td>18.6</td><td>21.0</td><td>21.7</td><td>23.5</td></tr></table>Determine MDD and OMC. If G = 2.7, calculate degree of saturation and percentage air voids at MDD</td><td>12</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="3">Q.4</td><td>(a)</td><td>Explain with neat sketches types of soil structure.</td><td>08</td></tr>
<tr><td>(b)</td><td>Distinguish between Standard Proctor and Modified Proctor compaction tests.</td><td>06</td></tr>
<tr><td>(c)</td><td>The in – situ void ratio of a granular soil deposit is 0.50. The maximum and minimum void ratios of soil were determined to be 0.75 and 0.35. Determine the relative density and relative compaction of the deposit. Take G = 2.67.</td><td>08</td></tr>
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<tr><td colspan="3">Module – 3</td><td></td></tr>
<tr><td rowspan="2">Q.5</td><td>(a)</td><td>In a site reclamation project, 2.5m of graded fill ($\gamma = 22kN/m^3$) were laid in compacted layers over an existing layer of silty clay ($\gamma = 18kN/m^3$) which was 3m thick. This was underlain by a 2m thick layer of gravel ($\gamma = 20kN/m^3$). Assuming that the water table remains at the surface of the silty clay draw the effective stress profiles for cases (i) before fill is placed (ii) after the fill has been placed.</td><td>12</td></tr>
<tr><td>(b)</td><td>With the help of neat sketch, derive the equation to determine permeability by the Falling head permeability test.</td><td>08</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="3">Q.6</td><td>(a)</td><td>Explain the method of locating the phreatic line in a homogeneous earth dam with filter.</td><td>08</td></tr>
<tr><td>(b)</td><td>Write a note on the factors affecting coefficient of permeability.</td><td>06</td></tr>
<tr><td>(c)</td><td>Calculate the horizontal and vertical permeabilities of a soil deposit consisting of three layers 1.5m, 1.8m and 2.0m thick with permeabilities 10^{-5} m/sec, 10^{-7} m/sec and 10^{-9} m/sec respectively.</td><td>06</td></tr>
<tr><td colspan="3">Module – 4</td><td></td></tr>
<tr><td rowspan="3">Q.7</td><td>(a)</td><td>Classify the shear tests based on drainage conditions. How are these drainage conditions realized in the field?</td><td>06</td></tr>
<tr><td>(b)</td><td>Explain the advantages of triaxial shear test over direct shear test.</td><td>06</td></tr>
<tr><td>(c)</td><td>A direct shear test was carried out on a cohesive soil sample and the following results were obtained:
<table><tr><td>Normal stress (kN/m^2)</td><td>150</td><td>250</td></tr><tr><td>Shear stress at failure (kN/m^2)</td><td>110</td><td>120</td></tr></table>What would be the deviator stress at failure if a triaxial test is carried out on the same soil with cell pressure of $150kN/m^2$?</td><td>08</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
<tr><td rowspan="3">Q.8</td><td>(a)</td><td>Explain Mohr – Coulomb failure theory of soil.</td><td>06</td></tr>
<tr><td>(b)</td><td>What are the factors affecting the shear strength of soil?</td><td>06</td></tr>
<tr><td>(c)</td><td>The following table gives data obtained from triaxial compression test conducted under undrained condition 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 c_u and $\emptyset_u$ by (i) graphical method or (ii) analytical method</td><td>08</td></tr>
<tr><td colspan="3">Module – 5</td><td></td></tr>
<tr><td rowspan="3">Q.9</td><td>(a)</td><td>Explain Mass - Spring analogy.</td><td>06</td></tr>
<tr><td>(b)</td><td>Explain how pre consolidation pressure is determined by Casagrande’s method.</td><td>06</td></tr>
<tr><td>(c)</td><td>In the laboratory a 2 cm thick soil sample takes 25 minutes to reach 30% degree of consolidation. Find the time taken for a 5 cm thick clay layer in field to reach 40% consolidation. Assume double drainage in both cases.</td><td>08</td></tr>
<tr><td colspan="3">OR</td><td></td></tr>
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Q.10	**(a)**	Explain determination of Coefficient of consolidation by square root of time fitting method.	06
	(b)	Explain pre consolidated, normally consolidated and under consolidated soil.	06
	(c)	A clay layer whose total settlement under a given load is expected to be 250mm, settles by 50mm in 15 days after the application of a load increment How many days will be required for it to reach a settlement of 125mm. How much settlement will occur in 300days? The layer has double drainage.	08

Table showing the Bloom's Taxonomy Level, Course Outcome and Programme Outcome

Question		Bloom's Taxonomy Level attached	Course Outcome	Programme Outcome
Q.1	(a)	L1	1	1
	(b)	L2	1	1
	(c)	L3	1	2
Q.2	(a)	L1	1	1
	(b)	L2	1	1
	(c)	L3	1	2
Q.3	(a)	L2	2	1
	(b)	L3	2	2
Q.4	(a)	L1	2	3
	(b)	L2	2	1
	(c)	L3	2	2
Q.5	(a)	L3	3	3
	(b)	L2	3	3
Q.6	(a)	L2	3	2
	(b)	L2	3	3
	(c)	L3	3	3
Q.7	(a)	L2	4	2
	(b)	L2	4	2
	(c)	L3	4	3
Q.8	(a)	L1	4	4
	(b)	L2	4	5
	(c)	L3	4	4
Q.9	(a)	L2	5	3
	(b)	L2	5	4
	(c)	L3	5	5
Q.10	(a)	L1	5	3
	(b)	L2	5	4
	(c)	L3	5	5

Bloom's Taxonomy Levels	**Lower order thinking skills**		
	Remembering(knowledge):L_1	Understanding Comprehension): L_2	Applying (Application): L_3
	Higher order thinking skills		
	Analyzing (Analysis): L_4	Valuating (Evaluation): L_5	Creating (Synthesis): L_6