Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

V SEMESTER B.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: GEOTECHNICAL ENGINEERING [CIE 3101]

REVISED CREDIT SYSTEM

(/ 12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **FIVE Full questions**.
- Missing data may be suitably assumed.

<table>
<tr><td>1A.</td><td>Explain dispersed structure and flocculated structure with neat sketch.</td><td>3</td><td>CO1</td></tr>
<tr><td>1B.</td><td>Obtain a relationship between degree of saturation, voids ratio, water content and specific gravity.</td><td>3</td><td>CO1</td></tr>
<tr><td>1C.</td><td>In the field, the soil is taken in a sampling tube of internal diameter 50mm and length 100mm. Its weight is 3.78N. If the specific gravity of the solids is 2.65 and the weight of the dried sample is 3.14N, calculate porosity, void ratio, degree of saturation and dry unit weight of the in-situ soil.</td><td>4</td><td>CO1</td></tr>
<tr><td>2A.</td><td>Explain the various corrections applied for hydrometer readings.</td><td>3</td><td>CO1</td></tr>
<tr><td>2B.</td><td>Two soils A and B are tested in the laboratory for the consistency limits. The data available are as follows:

<table><tr><th>Description</th><th>Soil A</th><th>Soil B</th></tr><tr><td>Plastic limit</td><td>18%</td><td>20%</td></tr><tr><td>Liquid limit</td><td>30%</td><td>60%</td></tr></table>Which soil is more plastic? Also calculate the consistency index and liquidity index if the natural water content of soil A is 42% and Soil B is 50%. Comment on the results.</td><td>3</td><td>CO1</td></tr>
<tr><td>2C.</td><td>The following results are obtained from a laboratory test on three soil samples. Classify the soils as per IS.

<table><tr><th>Soil</th><th>Soil A</th><th>Soil B</th></tr><tr><td>% passing 4.75mm</td><td>68</td><td>98</td></tr><tr><td>% passing 0.075 mm</td><td>3</td><td>84</td></tr><tr><td>Liquid limit (%)</td><td>25</td><td>45</td></tr><tr><td>Plastic limit (%)</td><td>15</td><td>15</td></tr><tr><td>C_u</td><td>6</td><td>2</td></tr><tr><td>C_c</td><td>2</td><td>1</td></tr></table></td><td>4</td><td>CO1</td></tr>
</table>

<table>
<tr><td>3A.</td><td>Explain field compaction control.</td><td>2</td><td>CO4</td></tr>
<tr><td>3B.</td><td>A falling head permeability test is to be performed on a soil sample whose coefficient of permeability is estimated to be about 3 x 10^{-5} cm/sec. What diameter of the stand pipe should be used if the head is to drop from 27.5 cm to 20 cm in 5 minutes and if the cross sectional area and length of the sample are 15 cm^2 and 8.5 cm respectively? Will it take the same time for the head to drop from 37.5 cm to 30 cm.</td><td>4</td><td>CO2</td></tr>
<tr><td>3C.</td><td>The profile of soil in a construction site consists of three layers: top layer with sand of 2m thick, middle layer of clay, 3m thick and bottom layer of silt, 4m thick. The water table is at 1.2m from ground level. The unit weight of sand above water table is 17.5 kN/m^3 and below water table is 18.5 kN/m^3. The properties of clay are: Water content=40%, specific gravity=2.6. The saturated unit weight of silt is 18 kN/m^3. Plot the total stress, effective stress and neutral stress diagram.</td><td>4</td><td>CO3</td></tr>
<tr><td>4A.</td><td>Explain the construction and uses of Newmarks chart.</td><td>3</td><td>CO3</td></tr>
<tr><td>4B.</td><td>Explain the square root time fitting method to determine coefficient of consolidation.</td><td>3</td><td>CO4</td></tr>
<tr><td>4C.</td><td>The soil profile at a building site consists of clay layer of thickness 5m overlain by a sand layer of 2.5m thick and underlain by impervious rock. The water table is at 0.5m below ground level. The sand has a unit weight of 18.15 kN/m^3 above and 18.65 kN/m^3 below the water table. The clay has a natural water content of 50%, liquid limit=60% and the specific gravity 2.7. Calculate the probable settlement resulting from a uniformly distributed load of 50kN/m^2 applied over an extensive area of the site.</td><td>4</td><td>CO4</td></tr>
<tr><td>5A.</td><td>List the properties and applications of flow net</td><td>3</td><td>CO2</td></tr>
<tr><td>5B.</td><td>Establish a relationship between major principal stress and minor principal stress in case of a triaxial test.</td><td>3</td><td>CO5</td></tr>
<tr><td>5C.</td><td>A direct shear test conducted on identical soil specimens gave the following results:
<table>
<tr><th>Trial No.</th><th>Normal stress (kN/m^2)</th><th>Shear stress (kN/m^2)</th></tr>
<tr><td>1</td><td>50</td><td>40</td></tr>
<tr><td>2</td><td>100</td><td>70</td></tr>
</table>
Determine the shear strength parameters. If an undrained triaxial test is conducted on the same soil at a cell pressure of 75 kN/m^2, estimate the deviator stress at failure.</td><td>4</td><td>CO5</td></tr>
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