Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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VI SEMESTER B.TECH. (CIVIL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2017
SUBJECT : APPLIED SOIL ENGINEERING [CIE 3201]
REVISED CREDIT SYSTEM
(20/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Explain with help of neat sketch Standard penetration test.	**4**
1B.	Write short notes on disturbed, non-disturbed and representative sample.	**3**
1C.	Determine the area ratios for the following soil sample and comment on the nature of sample obtained in each of the samplers. Sampler / Outer diameter in mm / Inner diameter in mm Core cutter / 165 / 150 Split barrel / 51 / 51 Seamles tube(Shelby) / 51 / 48	**3**
2A.	A vertical wall 5m high supports a saturated cohesive backfill with horizontal surface. The top 3m of backfill has γ =17.6kN/m^3, Φ = 0 and cohesion of 15kN/m^2. The bottom 2m of backfill has γ_{sat} = 19.2kN/m^3, Φ = 9° and c=20kN/m^2 respectively. Water table is at a depth of 4m from top of the retaining wall. Determine the depth of tension crack behind the wall. If the tension cracks develop, what will be the total active pressure and its point of application? Also determine the magnitude of the uniform surcharge which if placed over the backfill can prevent the formation of tension crack.	**6**
2B.	Explain with examples the two extreme conditions of limiting equilibrium.	**2**
2C.	Determine the passive earth pressure per meter run of the retaining wall of height 5m having the backfill sloping at an angle 10° and soil of Φ= 30° and γ= 18.8kN/m^3	**2**
3A.	Derive an equation for factor of safety for an infinite slope of cohesion less soil under steady seepage condition along the slope.	**3**
3B.	An excavation is to be made in a soil deposit with a slope of 25° to the horizontal and to a depth of 25 meters. The soil has the following properties: c'= 35kN/m^2, Ø= 15° and γ = 20kN/m^3. If the factor of safety with respect to cohesion is 1.5, what would be the factor of safety with respect to friction? Refer figure 3B.	**2**
3C.	Using method of slices determine the factor of safety for a slope of 2 (horizontal) to 1 (vertical) with a height of 4.5 m. It is made of a soil having cohesion of 15 kN/m^2, angle of internal friction of 17° and a unit weight of 20kN/m^3. Consider any slip circle passing through the toe and width of each slice =2m. (Given: Radius of slip circle = 7.7m, δ =112.61°)	**5**

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<table>
<tr><td>4A.</td><td>List any two advantages and disadvantages of plate load test.</td><td>2</td></tr>
<tr><td>4B.</td><td>Design a square footing to carry a gross safe load of 300kN inclined at an angle 12° to vertical. The depth of foundation is 1.2m and the soil properties are γ = 19.5kN/m^3 , Φ = 28° and c= 10kN/m^2. Assume local shear failure and take factor 0f safety as 3 Use IS code method.
<table>
<tr><th>Φ</th><th>Nc</th><th>Nq</th><th>Nγ</th></tr>
<tr><td>15</td><td>10.98</td><td>3.94</td><td>2.65</td></tr>
<tr><td>20</td><td>14.83</td><td>6.40</td><td>5.39</td></tr>
<tr><td>25</td><td>20.72</td><td>10.66</td><td>10.88</td></tr>
<tr><td>30</td><td>30.14</td><td>18.40</td><td>22.40</td></tr>
</table></td><td>5</td></tr>
<tr><td>4C.</td><td>A circular footing of 2m diameter has to carry a safe load of 2200kN to provide a factor of safety of 2.5. The foundation soil has unit weight of 18kN/m^3 above water table and 20.5 kN/m^3 below water table, Φ = 35° and cohesion of 12kN/m^2. Determine the depth at which the footing can be provided. Water table is at ground level. Use Terzaghi's analysis and assume general shear failure. Take bearing capacity factors Nc= 57.8, Nq = 41.4, Nγ = 42.4</td><td>3</td></tr>
<tr><td>5A.</td><td>Explain under reamed pile foundation with the help of neat sketch.</td><td>2</td></tr>
<tr><td>5B.</td><td>A square pile group of 16 piles passes through a soft compressible soil of 3m depth. The diameter of the pile is 600mm and pile spacing is 1m center to center. If the unconfined compressive strength of soil is 50kN/m^2 and unit, weight is 16kN/m^3, compute the negative skin friction of the pile group. Take m or α=0.7</td><td>3</td></tr>
<tr><td>5C.</td><td>Calculate the settlement of the pile group with 9 piles carrying a load of 2500kN for the soil condition as shown in the figure 5C.(Take 3 layers for the calculation of settlement)</td><td>5</td></tr>
</table>

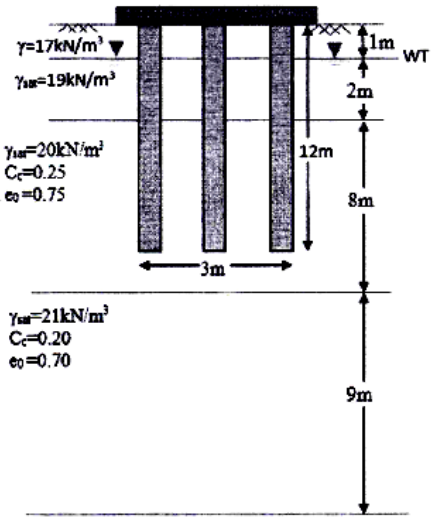

Figure 5C

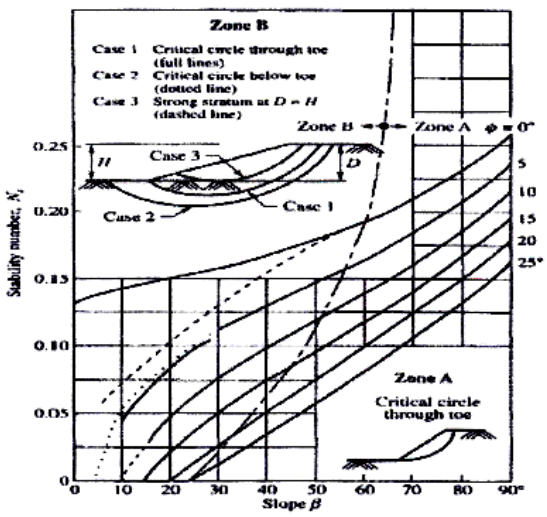

Figure 3B