Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY/JUNE 2016

SUBJECT: GEOTECHNICAL ENGINEERING II [CIE 302]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	A square group of 9 friction piles of 300mm diameter with 1200mm c/c spacing and 9m length is subjected to net load of 2500kN. The details of the soil properties are given below with reference to the ground level as datum. <table><tr><th colspan="2">Depth in m</th><th rowspan="2">Soil Properties</th></tr><tr><th>From</th><th>To</th></tr><tr><td>0</td><td>4</td><td>Clay, γ=16.5 kN/m^3, γ_{sat}=18.5 kN/m^3</td></tr><tr><td>4</td><td>16</td><td>Clay γ_{sat}=19.5 kN/m^3, C_c=0.25, e_0=0.80</td></tr><tr><td>16</td><td>21</td><td>Clay γ_{sat}=20.5 kN/m^3, C_c=0.20, e_0=0.70</td></tr><tr><td>21</td><td>-</td><td>Hard rock</td></tr></table>Estimate the consolidation settlement when the water table is at 2m from ground level and assuming 30° load distribution from 2/3 of the pile length. Also take 3 layers (each 5m thick) for the calculation of the consolidation settlement.	**6**
1B.	Discuss standard penetration test. What are the various corrections?	**4**
2A.	Explain the terms “inside clearance” and “outside clearance” as applied to a sampler. Why are they provided? Mention the permissible values.	**3**
2B.	Explain the construction of bored compaction pile foundation.	**3**
2C.	What is negative skin friction? A square pile group of 9 piles penetrates through a recently filled soil of 2.5m depth. The pile diameter is 300mm and pile spacing is 0.6m c/c. Taking cohesion of the soil as 20 kN/m^2, unit weight as 15 kN/m^3 and adhesion factor (m or α) as 0.5, compute the negative skin friction.	**4**
3A.	List the characteristics of general shear failure and local shear failure with neat sketch.	**4**
3B.	List the forces acting on well foundation And explain any two forces.	**3**
3C.	Determine coefficient of elastic uniform compression if the resonance occurred at a frequency of 25 cps in a vertical vibration of a test block 1m X 1m X1m. the weight of the oscillator is 900N and the force produced by it after 20 cycles is 1700 N. Compute the maximum amplitude in the vertical direction. Take weight of the test block as 25kN/m^3.	**3**
4A.	A square footing of size 2m x 2m carries a net safe load of 500 kN. The supporting soil is clayey sand having the following properties: c=12 kN/m^2, ϕ=25° and γ=18 kN/m^3. Find the depth at which the footing is to be located when the water table is at	**5**

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	a great depth such that the factor of safety of 3.0 is assured. What would be the size of the square footing if the water table rises to the ground level with the same foundation depth? (Take γ_{sat}=19.5 kN/m^3). Use Terzaghi's method.	
4B.	Define a) Allowable bearing capacity b) Safe bearing capacity c) Ultimate bearing capacity. Also give the mathematical expression to determine the same.	**3**
4C.	Draw a neat sketch of well foundation and name the parts.	**2**
5A.	A finite slope of height 10m is inclined at 45˚ with respect to horizontal. If the center of slip circle is defined by Fellinius directional angles α = 35˚ and β= 26˚, calculate factor of safety against toe failure of the slope given γ= 18kN/m^3, c= 10 kN/m^2 and φ = 30˚. Take width of slice as 4m.	**6**
5B.	A 5m high retaining wall having smooth vertical back supports a cohesive soil with horizontal surface. The top layer is 2.5m thick with γ =17 kN/m^3 , c= 10 kN/m^{2}and Φ=15°. The bottom layer is 2.5m thick with γ =18 kN/m^3 γ_{sat} =19.2 kN/m^3 , c= 9 kN/m^{2}and Φ=20°. The water table is found at 2.5m depth from top of the retaining wall. Plot the active pressure distribution diagram after the development of tension crack.	**4**
6A.	A retaining wall of 10m height retains a backfill with a uniform horizontal backfill having soil properties γ = 18 kN/m^{3}and Φ=30°. The wall interface is vertical with angle of wall friction to be 20°. Determine the magnitude of passive earth pressure using Coulomb's method.	**3**
6B.	List the assumption made in the Rankines theory of lateral earth pressure. Distinguish between the two extreme cases of limit equilibrium conditions in earth pressures with one example each.	**4**
6C.	A cutting of 8m deep is to be made in a clayey soil having γ= 17kN/m^3 and c = 18 kN/m^2. A hard stratum exists at a depth of 14m below ground level. Using Taylor's stability table find if 25˚ slope is safe or not. For factor of safety of 1.25, find the safe slope angle.	**3**

D_f / i	1.0	1.50	2.0	3.0	∞
53°	0.181	0.181	0.181	0.181	0.181
45°	0.164	0.174	0.177	0.180	0.181
30°	0.133	0.164	0.172	0.178	0.181
22.5°	0.113	0.153	0.166	0.175	0.181
15°	0.083	0.128	0.150	0.167	0.181
7.5°	0.054	0.080	0.107	0.140	0.181

Terzaghi's Bearing Capacity Factors

ϕ	N_c	N_q	N_γ	N_c'	N_q'	N_γ'
10	9.6	2.7	1.2	8	1.9	0.5
15	12.9	4.4	2.5	9.7	2.7	0.9
20	17.7	7.4	5	11.8	3.9	1.7
25	25.1	12.7	9.7	14.8	5.6	3.2