Reg. No.								
----------	--	--	--	--	--	--	--	--



## MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL

(A constituent institution of MAHE, Manipal)

## VI SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER EXAMINATIONS, APRIL/MAY 2018 SUBJECT: APPLIED SOIL ENGINEERING [CIE 3201] REVISED CREDIT SYSTEM

(18/ 04/ 2018)

Time: 3 Hours

MAX. MARKS: 50

## Instructions to Candidates:

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

Q.No	Question statement	CO & Marks
1A.	Explain different types of samples and samplers.	CO1 (3 Marks)
1B.	Inside diameter and outside diameter of a sample tube of length 300 mm are 75mm and 79 mm, and that of a cutting edge are 72 mm and 83 mm. Calculate the inside clearance, outside clearance, area ratio and recovery ratio if the sample collected is of 290 mm long. Comment the results.	CO1 (3 Marks)
1C.	The observed standard penetration test values in a deposit of fine silty sand were $12/14/18$ at 4m depth and $18/20/24$ at 8m depth. The average unit weight of the soil is $17.5 \text{ kN/m}^3$ . Determine the corrected N value at 4m and 8m depths. Also determine the corrected N value at 4m depth when the water table raises to a level of 4m from the ground level. (Assume average saturated unit weight of soil below the water table as $19.5 \text{ kN/m}^3$ )	CO1 (4 Marks)
2A.	Draw the active earth pressure diagram and calculate the total active earth pressure with point of application, for a 6m high retaining wall as shown in Figure Q.2A.	CO2 (6 Marks)
2B.	Explain the forces acting on the failure wedge in Coulomb's wedge theory for passive case and give the expression for coefficient of passive earth pressure.	CO2 (2 Marks)
2C.	A retaining wall 6m high, retains a cohesion less soil with $\phi = 32^{\circ}$ and $\gamma = 18$ kN/m <sup>3</sup> . The wall has a smooth vertical back and the backfill has horizontal surface. Calculate the magnitude and point of application of total thrust against the wall, when the backfill is fully drained and the top of wall is restrained against yielding.	CO2 (2 Marks)
3A.	Using Friction Circle method, determine the factor of safety against sliding for a slope of height 12m and slope angle 35°. The trial slip circle of radius 20m and central angle 74.5°, passes through the toe. The properties of soil are c=28kN/m <sup>2</sup> , $\phi$ =18° and $\gamma$ =20kN/m <sup>3</sup> . Take a scale of lcm = 2m to plot the slope.	CO3 (7 Marks)
3B.	A slope on 1V: 1.5H, with a height of 8m has the following properties: $c=26kN/m^2$ , $\phi=10^{\circ}$ and $\gamma=19kN/m^3$ . Using Taylors stability table, calculate the factor of safety with respect to cohesion and obtain the critical height of the slope.	CO3 (3 Marks)

4A.	List the (i) factors effecting bearing capacity and (ii) limitations of plate load test	CO4 (3 Marks)
4B.	A square footing 203m x 2.3 m carries a load intensity of 550 kPa, at a depth of 1.4m in a sandy soil. Taking saturated unit weight of soil as 19.3 kN/m <sup>3</sup> , unit weight above water table as 17.2 kN/m <sup>3</sup> and $\phi$ =35°, determine the factor of safety with respect to shear failure. Use Terzaghi's equation. Assume the water table is at the base of the footing. (Nc=57.8, Nq=41.4 & Ny=42.4)	CO4 (4 Marks)
4C.	A square footing of size 1.8m x 1.8m is located at a depth of 2m. The soil is sandy with corrected SPT number 15. Assuming the water table is at a great depth, determine the safe settlement pressure for an allowable settlement of 25mm using Teng's equation. Also calculate the safe settlement pressure, if the water table rises to the ground level.	CO4 (3 Marks)
5A.	Explain negative skin friction.	CO5 (2 Marks)
5B.	A bored pile of 250 mm diameter is driven in a two layered soil to carry a safe load of 250 kN. The top layer has a thickness of 8m and the bottom one is of, considerable depth. The undrained cohesion of top layer is 50 kN/m <sup>2</sup> and that of the bottom is 60 kN/m <sup>2</sup> . Determine the length of the bored pile required. Take a factor of safety of 2.5 and adhesion factor ( $\alpha$ ) as 0.7.	CO5 (3 Marks)
5C.	A square pile group consists of 16 piles of 300 mm diameter and 12m length driven in soil comprising of two layers with the following properties: Layer l(upper): 4m thick, $c_u=60 \text{ kN/m}^2$ , $\gamma=18 \text{ kN/m}^3$ and $\alpha=0.9$ , Layer 2 (lower): 8m thick, $c_u=90\text{kN/m}^2$ , $\gamma=19 \text{ kN/m}^3$ and $\alpha=0.7$ ). Center to center spacing of piles is 900 mm. Determine the safe load for the Take FOS 3.	CO5 (5 Marks)

Taylor's stability table:

¢m i	0°	5°	10°	15°	20°	25°
90°	0.261	0.239	0.218	0.199	0.182	0.166
75°	0.219	0.195	0.173	0.152	0.134	0.117
60°	0.191	0.162	0.138	0.116	0.097	0.079
45°	(0.170)	0.136	0.108	0.083	0.062	0.044
30°	(0.156)	(0.110)	0.075	0046	0.025	0.009
15°	(0.145)	(0.068)	0.070	(0.023)		

[Note, Figures in brackets are for the most dangerous circles through the toe when a more dangerous circle exists below the toe].

