



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 retaining wall has a smooth vertical back supports a stratified backfill of 6m height and carries a surcharge load of 10 kN/m ² . The backfill is with two layers with horizontal surface. Top layer is 3 m thick with γ =17 kN/m ³ , γ_{sat} =18.5 kN/m ³ , c=0 and Φ =30°. The bottom layer is 3 m thick with γ_{sat} =20 kN/m ³ , c= 8 kN/m ² and Φ =20°. The water table is at a depth of 2m from the top of the retaining wall. Draw earth pressure distribution diagram when the wall moves away from the backfill.								
1B.	An embankment has a slope of 2 horizontal to 1 vertical with height of 10m. It is made of soil having cohesion 30 kN/m ² , φ =8° and γ = 20kN/m ³ . Use friction circle method to find the factor of safety with respect to cohesion if the slip circle passes through the toe. The radius of slip circle is 20m and δ =86°. The resultant weight of magnitude 2448kN of the soil above slip surface acts at a horizontal distance of 13.8m from toe.								
2A.	Determine the total passive earth pressure on the wall of height 5m having smooth vertical back if the backfill is inclined at 15° to horizontal. The soil properties are with $\gamma = 19 \text{ kN/m}^3$ and $\Phi = 30^\circ$.								
2B.	A canal 3m deep runs through a soil having the following properties, $c=10kN/m2$, $\varphi=10^{\circ}$, $e=0.8,G=2.72$. the angle of slope of the banks is 45°. Determine the Factor of safety with respect to cohesion when the canal is full upto the top of the banks. What will be factor of safety in case of sudden drawdown?								
	Stability Number S_n 0.1700.1300.1080.0830.002Angle of internal friction φ 0° 5° 10° 15° 20°								
2C.	Derive the expression for Rankine total active earth pressure after the occurrence of tension crack for a cohesive soil.								
3A.	What is an under reamed pile? Under what circumstances these piles are provided.								
3B.	Describe the salient features of good sub-soil investigation report.	3							
3C.	For an industrial structure, circular concrete piles are planned to use as a foundation. The soil at the site comprises of layered sand deposit. Top layer is medium sand $(\phi=35^{\circ}, \gamma=18.5 \text{ kN/m}^3, \text{ K}=3 \text{ and tan } \delta=0.50$) for a depth of 3m and below which with dense sand ($\phi=40^{\circ}$ and $\gamma_{\text{sat}}=19.5 \text{ kN/m}^3$, K=3.2 and tan $\delta=0.40$). The water table								

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	is located at a depth of 3m from ground level. As per the design requirements, driven piles of 250mm diameter and 10 m length have to be used. Determine the safe load considering a factor of safety of 2.5. Take $N_q = 105$.								
4A.	The observed N value in a deposit of fully submerged fine sand was 30 at a depth of 5m. The average saturated unit weight of the soil is 19.5 kN/m ³ . Calculate the corrected N value.								
4B.	The inside and outside diameter of the sample tube is 56mm and 62mm and inside and outside diameter of the cutting edge is 54mm and 63mm respectively. Calculate the inside clearance, outside clearance and area ratio of the sampler. Comment on the results.								
4C.	Explain (a) Fender pile (b) Batter pile (c) Sheet pile	3							
5A.	Assuming resonance to have occurred at a frequency of 40 cycles /sec in a vertical vibration of a test block 1m X 1m X 1m, determine the coefficient of elastic compression. The weight of the oscillator is 1200N and the force produced by it after 10 cycles is 1700 N. Weight of the test block is 24kN/m ³								
5B.	Explain any three measures taken to rectify tilts and shifts in well sinking.	3							
5C.	A square footing is required to carry a net safe load of 1000kN. Determine the size of the footing if the depth of the foundation is 2.2m and the tolerable settlement is 25 mm. The soil is sandy with N=14. The water table is very deep. Use Teng's equation. Take depth correction factor=1.2.								
6A.	A square footing 2mX2m carries a net load intensity of 100 kN/m ² at a depth of 0.8m in sand. The saturated unit weight of sand is 19.5 kN/m ³ and unit weight above water table is 16.5 kN/m ³ . If c=0 and φ =23°, determine the factor of safety with respect to shear failure if the water table is 1m below ground level. Compare the results from both Terzaghi and IS code method.								
6B.	Define a) Resonance b)Natural frequency c)Free vibration d) Forced vibration	2							
6C.	Explain vibration isolation.	2							

Terzaghi's Bearing Capacity Factors							IS: 6403-1981			
ф	Nc	Nq	Nγ	N _c '	N _q '	N _Y '	φ	Nc	Na	Nv
10	9.6	2.7	1.2	8	1.9	0.5	10	8.35	2.47	1.22
15	12.9	4.4	2.5	9.7	2.7	0.9	15	10.98	3.94	2.65
20	17.7	7.4	5	11.8	3.9	1.7	20	14.83	6.4	5.39
25	25.1	12.7	9.7	14.8	5.6	3.2	25	20.72	10.66	10.88