MANIPAL INSTITUTE OF TECHNOLOGY

VI SEMESTER B.TECH. (CIVIL ENGINEERING) END SEMESTER MAKEUP

EXAMINATIONS JUNE 2024

SUBJECT: APPLIED SOIL ENGINEERING [CIE 3251]

Date of Exam: 29/06/2024

(A constituent unit of MAHE, Manipal)

Time of Exam:

Max. Marks: 50

Instructions to Candidates:

Answer ALL the questions & missing data may be suitably assumed

Q.	QUESTION			MARKS	CO	BL	
	A retaining wal in figure. Comp earth pressure.	l with a smo oute the mag The water tab	oth vertical back retanitude and point of a point of a point of a pole is at 3.2m from the c=0 2 m $\Phi=25^{\circ}$ $\gamma=17.5$ kN/ .5 m $\Phi=32^{\circ}$ $\gamma_{sat}=19.5$ kN	ains two-layered soil as shown application of Rankine's active and GL GL m ³ wT	5	CO2	4
18	A retaining wal properties: Depth 0-3 m 3 m to 6 m 6 m to 9 m Analyze and plo	l of 9 m high Cohesion (kN/m ²) 10 0 12 ot Bankine's	Angle of Internal friction (°) 22 30 24 passive earth pressu	Unit weight of soil (kN/m ³) 16.5 18.5 19.0	3	CO2	4
1C	Discuss the variation of earth pressure with the wall movement and discuss.			2	CO2	2	
2A	For the slope sh shear strength u degrees and ass	nown in the f using method ume the widt	figure, compute the t d of slices. Take c= th of all slices as sam	factor of safety with respect to 18 kN/m ² , γ =19 kN/m ³ , ϕ =28 me = 1.8 m.	5	CO3	4



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	0 12 m			
	$\delta = 74^{\circ}$			
	$\theta = 7^{\circ}$			
	$ \begin{array}{c} \bullet \bullet \\ \bullet \bullet \\ \bullet $			
	$\theta = 14^{\circ} \theta = 19^{\circ} \theta = 25^{\circ}$			
1 D	A = 40.9 show with a bright of C we have the full entropy and a section.	2	<u> </u>	2
28	A 40° slope with a neight of 6 m has the following properties: $2-25 \text{ kN/m}^2 \text{ d} = 15^{\circ} \text{ and } \text{ v} = 10 \text{ kN/m}^3$	2	COS	3
	C=25 KiV/III, φ =15 and γ =19 KiV/III. Calculate the FoS with respect to cohesion and the critical height of the slope			
2C	Discuss any three causes of the failure of slopes?	3	CO3	2
3A	A square footing is to be constructed at a depth of 1.2 m in a deposit of soil	4	CO4	4
	with cohesion 12kPa and angle of internal friction 26°. It must carry a design			
	load of 300 kN with a factor of safety of 2.5, if the water table rises to ground			
	level during rainy season. Using Terzaghi's method, compute the size of facting given $y_{\pm} = 20.2 \text{ kN/m}^3$ and $y_{\pm} = 18.8 \text{ kN/m}^3$			
3R	A strip footing 2.2 m wide is built on a homogeneous bed of sand having unit	4	CO4	4
01	weight 19.1 kN/m ³ and angle of shearing resistance of 40° . The depth of	•	004	-
	foundation and water table are at 1.5 m below ground surface. Using IS Code			
	method, compute factor of safety if the net allowable load on footing is			
20	$2/00$ kN. Given $\gamma_{sat} = 20.8$ kN/m ³	2	<u>CO4</u>	2
<u> </u>	A square pile group of 16 piles penetrates through a recently filled soil of 3 m	5	C04	<u></u>
ТЛ	depth as shown in Figure. The length, diameter and spacing are 12m, 450 mm	J	0.05	-
	and 1.2 m respectively. Compute the negative skin friction and safe load that			
	can be applied on the pile group. Take factor of safety as 2.			
	c _e = 22 kPa			
	3 m v= 17 kb/m ³ Filled Soil			
	$\alpha = 0.5$			
	<u> </u>			
	T			
	c,= 60 kPa			
	$\varphi = 0$			
	9 m $\gamma = 1.53 \text{ km/m}$ $\alpha = 0.6$			
	1			
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4B	Discuss any two types of piles based on its function.		CO5	2
4 C	Describe the construction of bored compaction piles and state its advantages.		CO5	2
5A	A group of 25 piles [5 in each row] was installed in a layered clay soil deposit.		CO5	4
	The diameter of each pile is 500 mm and their center-to-center spacing is 0.9			
	m. If the length of pile is 15 m, compute the safe load carrying capacity of the			
	group with a factor of safety of 2. The soil details are as follows:			
	0-8m depth: $\Phi = 0$, $c_u = 47 \text{kN/m}^2$, m=0.9			
	$8m - 25m$ depth: $\Phi = 0$, $c_u = 75kN/m^2$, $m = 0.6$			
5B	The field N value in a deposit of fully submerged fine sand was 38 at a depth	3	CO1	3
	of 5m. The average saturated unit weight of the soil is 18.5kN/m ³ . Calculate			
	the corrected N value as per IS 2131-1981.			
5 C	Discuss any four factors that affect bearing capacity.	2	CO4	2