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Question Paper Code	11664

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Fourth Semester

Civil Engineering

20CEPC403 - SOIL MECHANICS

(Regulations 2020)

Duration: 3 Hours Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	A soil has void ratio of 0.65 and specific gravity 2.80. Determine unit weight of soil.	*2,K3,CO1*
2.	Define plasticity index and flow index.	*2,K1,CO1*
3.	List the methods of finding field-permeability	*2,K1,CO2*
4.	What are the different types of soil water?	*2,K1,CO2*
5.	What is a zero air voidsline? Draw ac ompaction curve and show the zero air voids line.	*2,K1,CO3*
6.	Identify the limitations of Terzaghi's analysis in one dimensional consolidation theory.	*2,K2,CO3*
7.	Discuss the disadvantages of direct shear test.	*2,K2,CO4*
8.	Explain the term stress isobar or pressure bulb.	*2,K2,CO4*
9.	Develop points on various slope protection measures.	*2,K2,CO6*
10.	Write the expression for FOS for cohesion.	*2,K1,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	A laboratory compaction test on a soil having G = 2.68 gave a maximum dry density of 1.82 g/cc and water content of 17%. Determine the degree of saturation, air content and percentage of air voids at the maximum dry density. What would be the theoretical maximum dry unit weight corresponding to zero air voids at the OMC?	*13,K2,CO1*
		OR	
	b)	Sandy soil in a borrow pit has unit weight of solids as 25.8 kN/m^3, water content equal to 11% and bulk unit weight equal to 16.4 kN/m^3. How many cubic meters of compacted fill could be constructed of 3500m^3 of sand excavated from the borrow pit, if the required value of porosity in the compacted fill is 30%. Also calculate the change in degree of saturation.	*13,K3,CO1*

12. a) A soil deposit consists of a sand layer of 5m thick followed by a clay layer. The water table is at a depth of 2m from the ground level and the dry and saturated unit weight of 16 kN/m^3 and 20 kN/m^3 respectively. Draw the variation of total, neutral and effective stress in the sandy layer. If there is a sudden pore pressure of 20 kN/m^2 at the bottom of the sand layer, what will be the change in effective stress in the sandy layer. *13,K3,CO2*

OR

b) Compute the total, effective and pore water pressure at a depth of 20m below the bottom of a lake 6m deep. The bottom of the lake consists of soft clay with a thickness of more than 20m. The average water content of the clay is 35% and specific gravity of the soil may be assumed to be 2.65. *13,K2,CO2*

13. a) A clay layer 4m thick is subjected to a pressure of 55 kN/m^2. If the layer has double drainage and undergoes 50% consolidation in one year, determine the coefficient of consolidation. Take the time factor as 0.196. If the coefficient of permeability is 0.020m/year, determine the settlement in one year. *13,K3,CO3*

OR

b) A stratum of clay 8m deep has w_L = 45%. The surface of clay is at 10m below the present ground level, w = 40% and G = 2.78 for clay. Between the ground surface and clay, the subsoil consists of fine sand. The ground water level is 4.5m below ground level. The average submerged unit weight of sand is 10.4 kN/m^3 and the unit weight of sand above the groundwater level is 17kN/m^3. The clay is normally consolidated. The weight of structure coming on top of the sand above the clay increases the overburden pressure on clay by 40 kN/m^2. Calculate the settlement of the building. *13,K3,CO3*

14. a) With the help of a Mohr's circle for each case, explain how shear strength parameters are determined by conducting shear tests on saturated samples under different drainage conditions. *13,K3,CO4*

OR

b) Explain Mohr's coulomb failure theory. Derive the relation between principal stresses at failure and shear strength parameters. *13,K3,CO4*

15. a) A canal is to be excavated to a depth of 6m below ground level, through a soil having the following characteristics: c = 15kN/m^2, φ = 20°, e = 0.9 and G = 2.67. The slope of the bank is 1 in 1. Determine the factor of safety with respect to cohesion when the canal runs full. What will be the factor of safety if the canal is rapidly emptied completely? *13,K2,CO6*

OR

b) Calculate the factor of safety with respect to cohesion of a clay slope laid at 1 in 2 to a height of 10m, if the angle of internal friction φ = 10°, c = 25 kN/m^2 and γ = 19 kN/m^3. What will be the critical height of the slope in this soil? *13,K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Unconsolidated undrained triaxial tests were carried out on three identical specimens of a partly saturated clay. the following results were obtained: *15,K3,CO5*

Specimen no.	Cell pressure (kPa)	Deviator stress at failure (kPa)
1	50	81.7
2	100	101.3
3	150	113.6

Determine the shear strength parameters of the soil.

OR

b) Explain with neat sketches the procedure for conducting direct shear tests. Give its advantages over other methods of finding shear strength of soil. *15,K3,CO5*