Course Code: 1950120 Roll No: MLRS- R19

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

III B.Tech I Sem Regular End Examination, January 2022

Geotechnical Engineering

(CIVIL)

Time: 3 Hours. **Max. Marks: 70**

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10 x 2 Marks = 20 Marks)

1.	a)	Write about dispersive structure of soil	2M	CO1	BL2
	b)	Define dry unit weight and unit weight of dry soil solids	2M	CO1	BL1
	c)	Define Darcy's law.	2M	CO2	BL1
	d)	Define seepage velocity and write relation between porosity and seepage velocity.	2M	CO2	BL2
	e)	Write benefits of soil compaction.	2M	CO3	BL2
	f)	Define pressure bulb and write its uses.	2M	CO3	BL1
	g)	What is normally consolidated soil?	2M	CO4	BL2
	h)	Define double drainage system and its maximum drainage path.	2M	CO4	BL1
	i)	How soil derives its shear strength?	2M	CO5	BL2
	j)	Define critical void ratio.	2M	CO5	BL1

PART- B

(10 x 5 Marks = 50 Marks)

2	a)	Derive the fundamental equation in soil mechanics, ***es = Gw*** by defining e, s, G and w.	5M	CO1	BL2
	b)	One cubic metre of wet soil weighs 19.80 kN. If the specific gravity of soil particles is 2.70 and water content is 11%, find the void ratio, dry density and degree of saturation.	5M	CO1	BL3

OR

3		A soil sample with a grain specific gravity of 2.67 was filled in a 1000 ml container in the loosest possible state and the dry weight of the sample was found to be 14.75 N. It was then filled at the densest state obtainable and the weight was found to be 17.70 N. The void ratio of the soil in the natural state was 0.63. Determine the density index in the natural state. Also comment whether the in-situ soil needs improvement or not.	10M	CO1	BL4

4	a)	How void ratio and particle size affects the permeability of soil. Discuss with clear illustrations.	5M	CO2	BL2
	b)	Calculate the coefficient of permeability of a soil sample, 6 cm in height and 50 cm^2 in cross-sectional area, if a quantity of water equal to 430 ml passed down in 10 minutes, under an effective constant head of 40 cm.	5M	CO2	BL3
		OR			
5		Determine the average horizontal and vertical permeability of a soil mass made up of three horizontal strata, each 1 m thick, if the coefficients of permeability are $1 \times 10{-}1$ mm/s, $3 \times 10{-}1$ mm/s, and $8 \times 10{-}2$ mm/s for the three layers.	10M	CO2	BL4
6	a)	Explain why Zero Air Void Line is drawn along with compaction curve.	5M	CO3	BL2
	b)	Writing the specifications of standard and modified compaction tests, compare their compaction energies and associated compaction curves.	5M	CO3	BL4
		OR			
7		How you construct New marks chart and discuss its application.	10M	CO3	BL4
8	a)	Describe the limitations of 1-D Consolidation theory.	5M	CO4	BL2
	b)	In a consolidation test the following results have been obtained. When the load was changed from 50 kN/m^2 to 100 kN/m^2, the void ratio changed from 0.70 to 0.65. Determine the coefficient of volume decrease, m_v and the compression index, C_c.	5M	CO4	BL3
		OR			
9		In a laboratory, the consolidation test was performed on a specimen of clay 3cm thick. The sample was drained at top and bottom. The time required for 50% consolidation of the sample was observed to be 15 minutes. Determine the coefficient of consolidation of clay.	10M	CO4	BL3
10	a)	Discuss when we consider UU, CU and CD tests in geotechnical analysis.	5M	CO5	BL2
	b)	Calculate the potential shear strength on a horizontal plane at a depth of 3 m below the surface in a formation of cohesionless soil when the water table is at a depth of 3.5 m. The degree of saturation may be taken as 0.5 on the average. Void ratio = 0.50; grain specific gravity = 2.70; angle of internal friction = 30°. What will be the modified value of shear strength if the water table reaches the ground surface?	5M	CO5	BL4
		OR			
11		The following data relate to a triaxial compression tests performed on a soil sample:	10M	CO5	BL4

Test Np.	*Chamber pressure*	*Max. deviator stress*	*Pore pressure at maximum deviator stress*
1	80 kN/m^2	175 kN/m^2	45 kN/m^2
2	150 kN/m^2	240 kN/m^2	50 kN/m^2
3	210 kN/m^2	300 kN/m^2	60 kN/m^2

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