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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Civil Engineering

Semester End Examination; July / Aug. - 2022

Geotechnical Engineering - I

Time: 3 hrs *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: History of soil mechanics, origin and formation of soil.

CO2: Clay mineralogy and soil structure, soil as three phase system and inter relationship.

CO3: Index properties and their determination, classification of soil.

CO4: Flow of water through soils, effective stress concept, compaction of soil.

CO5: Consolidation of soil and shear strength of soil.

***Note**: I) **PART - A** is compulsory. **Two** marks for each question.*

*II) **PART - B**: Answer any **Two** sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Define void ratio, porosity, and degree of saturation with the help of 3 phase diagram.	2	L1	CO1	PO1
b.	Define liquid limit and plastic limit.	2	L1	CO2	PO2
c.	Define seepage and superficial velocity.	2	L1	CO2	PO2
d.	Define normally and under consolidated soil.	2	L1	CO3	PO7
e.	Define sensitivity of clay.	2	L1	CO4	PO2
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	With sketch, explain the common clay minerals.	9	L2	CO1	PO1
b.	With usual notations prove that, $r_d = \frac{G\, r_w}{1+e}$.	9	L3	CO1	PO1
c.	A soil sample has a porosity of 40%. The specific gravity of solids is 2.70. Calculate; i) Void ratio ii) Dry density iii) Unit weight if the soil is 50% saturated iv) Unit weight if the soil is completely saturated	9	L2	CO1	PO1
	UNIT - II	**18**			
2 a.	Explain determination of in-situ density of soil by core cutter method.	9	L2	CO2	PO2
b.	A liquid limit test on clay sample gave following results. The plastic limit of soil is 20% and natural waste content is 60%. Plot flow curve and obtain liquid limit, plasticity index and toughness index.	9	L2	CO2	PO2
c.	Explain the plasticity chart and its importance.	9	L2	CO2	PO2

Number of blows	12	18	22	34
Water content (%)	56	52	50	45

Contd… 2

UNIT - III **18**

3 a.	Write the assumptions and limitations of Darcy's law for the flow through soil.	9	L2	CO2	PO2
b.	Calculate the horizontal and vertical permeability of a soil deposit consisting of 3 layers 150 cm, 180 cm and 200 cm thickness with permeability of 10^{-5}, 10^{-7} and 10^{-9} m/s.	9	L2	CO2	PO2
c.	Explain the factors affecting compaction.	9	L3	CO2	PO2

UNIT - IV **18**

4 a.	Write the assumptions and limitations of Terzaghi's one dimensional consolidation theory.	9	L2	CO3	PO7
b.	In a consolidation test of soil sample 20 mm in thickness took 28 min to reach 90% consolidation under two way drainage condition, for the same soil in the field, what would be the time taken in days for 50% and 90% consolidation? If the thickness of the soil layer is 4 m and if there is: i) One drainage, and ii) Two drainage.	9	L3	CO3	PO7
c.	Explain how pre-consolidation pressure is determined by Casagrande's method?	9	L2	CO3	PO7

UNIT - V **18**

5 a.	Explain Mohr-Coulomb failure theory of soil.	9	L2	CO4	PO2
b.	In direct shear test was carried out on a cohesive soil sample and the following results were obtained. What would be the deviator stress at failure of a tri-axial test is carried out on the same soil with cell pressure of 150 kN/m^2?	9	L3	CO4	PO2

Normal stress (kN/m^2)	150	250
Shear stress (kN/m^2)	110	120

c.	Explain the tri-axial shear test under different drainage conditions.	9	L2	CO4	PO2

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