

Reg. No.

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B.E / B.TECH.DEGREE EXAMINATION, MAY 2023

Fourth Semester

CE18403 – BASIC GEOTECHNICAL ENGINEERING

(Civil Engineering)

(Regulation 2018)

TIME: 3 HOURS

MAX. MARKS: 100

- CO1** Describe the procedures to determine index properties of any type of soil, classify the soil based on its index properties
- CO2** Determine compaction characteristics of soil and apply that knowledge to access field compaction procedures
- CO3** Analyze the problems related to permeability and seepage characteristics of a given type of soil
- CO4** Solve problems related to estimation of consolidation settlement of soil deposits also time required for the same
- CO5** Estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory

PART- A(10x2=20Marks)

(Answer all Questions)

	CO	RBT LEVEL
1. Define specific gravity of soil solids.	1	1
2. Write the size of sand and clay particle as per the Indian standards?	1	1
3. What is meant by OMC and ZAV?	2	1
4. List different clay minerals.	2	1
5. State Darcy's law with its assumptions.	3	1
6. Why capillary rise taking place above the water table?	3	1
7. List the different types of settlement?	4	1
8. What is meant by one way and two way drainage condition?	4	1
9. What are the different stages in shear test?	5	1
10. Classify the soil based on the shear strength parameters.	5	1

PART- B (5x 14 = 70 Marks)

	Marks	CO	RBT LEVEL
11. (a) A soil sample has a porosity of 25%. The specific gravity of solids is 2.65. Take $V_w = 10 \text{ kN/m}^3$. Calculate the following	(14)	1	3
i) Void ratio			

- ii) Dry density,
- iii) Unit weight if the soil is 50% saturated
- iv) Water content if the soil if 50% saturated
- v) Unit weight if the soil is completely saturated
- vi) Water content if the soil is completely saturated

(OR)

- (b)** The following results are obtained from a soil sample by conducting different laboratory tests. (14) 1 3

Percentage Passing 4.75 mm sieve	=	50
Percentage Passing 75 micron sieve	=	7
Size corresponding to 10% finer	=	0.8 mm
30% finer	=	3.0 mm
60% finer	=	6.0 mm
Liquid Limit	=	40%
Plastic Limit	=	20%

Classify the soil as per IS soil classification system.

- 12. (a)** Explain the Proctor compaction test to determine the compaction characteristics of soil with neat sketch. (14) 2 3

(OR)

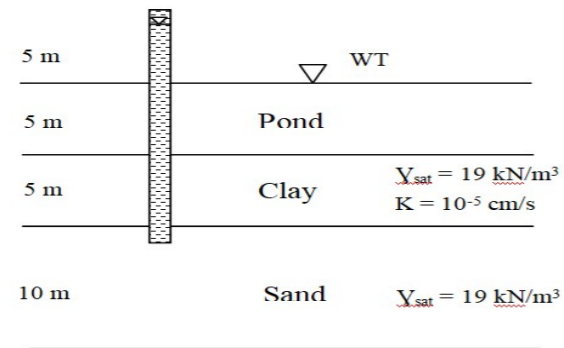
- (b)** (i) With a neat sketch, explain the dry side of optimum and the wet side of optimum. (4) 2 3
(ii) Discuss the effect of soil properties due to the compaction in detail. (10)

- 13. (a)** The ground water table in a deep deposit of sand is located at 4 m from the ground level. Due to capillary action, sand is saturated for a height of 1.5 m from the water table. The degree of saturation of the sand above the capillary fringe is 40%. The specific gravity of solids and average void ratio of the sand is 2.68 and 0.72. Draw the variation of total stress, neutral stress and effective stress up to 15 m depth from the ground surface. (14) 3 3

(OR)

- (b)** At the construction site, the profile of the soil observed as below. The water level rose 5 m above the water level in the pond in the standpipe inserted in the sand stratum. The soil characteristics of each layer mentioned in figure. (14) 3 3

Plot the variation of the total stress, effective stress and pore water stress along the depth. Also determine the change in the effective stress at 2 m below the clay layer when the water level reaches the top of the clay layer and the surcharge of 100 kPa acts on it. Take $\gamma_w = 10 \text{ kN/m}^3$.



14. (a) Discuss in detail about “Logarithm of Time Fitting” method to find the coefficient of consolidation with neat sketch. (14) 4 3

(OR)

- (b) Derive the one dimensional consolidation equation and narrate the assumptions made. (14) 4 3

15. (a) Explain the Tri-axial compression test to determine the shear strength parameters in detail with neat sketch. (14) 5 3

(OR)

- (b) Sketch the field vane shear test and derive the expression to arrive the shear strength parameters of the soil (14) 5 3

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

- | | Marks | CO | RBT LEVEL |
|---|-------|----|-----------|
| 16. The results of a direct shear test on a 60 mm x 60 mm specimen are given below. | (10) | 5 | 5 |

Test No.	1	2	3
Normal Load (kN/m ²)	150	250	350
Shear Stress at failure (kN/m ²)	110	170	240

Determine the shear strength parameters. Also, draw the Mohr’s circle for the test no. 3.