

5E1743	Roll No. _____	Total No. of Pages : 3
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	B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025	
	Civil Engineering 5CE4-04 Geotechnical Engineering	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions, from Part A, Five questions out of Seven questions from Part B and Three questions out of Five question from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

ALL questions are Compulsory.

(10×2=20)

- ~~1.~~ State Darcy's law of permeability.
- ~~2.~~ Define void ratio and air void.
3. Define isobar diagram.
- ~~4.~~ Differentiate active and passive earth pressure.
5. What are the different consistency limits for fine grained soils?
- ~~6.~~ Distinguish compaction and consolidation.
- ~~7.~~ What are the different types of slope failures?
- ~~8.~~ Differentiate between normally consolidated and over consolidated soil.
- ~~9.~~ State the significance of SPT-N value.
- ~~10.~~ Discuss about disturbed and undisturbed soil samples.

PART - B
(Analytical/Problem solving questions)

Attempt any FIVE questions.

(5×4=20)

1. A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeabilities of these layers are 8×10^{-4} cm/s, 52×10^{-4} cm/s, and 6×10^{-4} cm/s and their thicknesses are 7, 3 and 10 m respectively. Find the effective average permeability of the deposit in the horizontal and vertical directions.
2. Explain the Mohr-Coulomb failure criterion with a neat sketch.
3. What is quick sand condition? Derive the relation for critical hydraulic gradient.
4. Two identical specimens were tested in a triaxial apparatus. First specimen failed at a deviatoric stress of 770 kPa when the cell pressure was 200 kPa. Second specimen failed at a deviatoric stress of 1370 kPa under a cell pressure of 400 kPa. Determine the value of c and angle of internal friction.
5. Derive the expression for the factor of safety of an infinite slope in a cohesionless soil.
6. A layer of soft clay is 6 m thick and lies under a newly constructed building. The weight of sand overlying the clayey layer produces a pressure of 260 kPa and the new construction increases the pressure by 100 kPa. If the compression index is 0.5, compute the settlement. Water content is 40% and specific gravity of grains is 2.65.
7. Derive the expression for the minimum depth of foundation using Rankine's theory.

PART - C
(Descriptive/Analytical/Problem solving/Design questions)

Attempt any THREE questions.

(3×10=30)

1. Elaborate on the IS soil classification system and different symbols used. Also, draw the plasticity chart as per IS soil classification. <https://www.rtuonline.com>
2. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi, listing the various assumptions.
3. Describe the construction of Newmark's Influence chart with a neat sketch and explain how it is used to compute vertical stress beneath a point in a soil mass due to a uniformly loaded area.

4. A retaining wall 10 m high retains cohesionless soil with angle of internal friction 35 degrees. The top of the soil is level with the top of the wall and is horizontal. The unit weight of the top 4 m is 16 kN/m^3 and the rest is 20 kN/m^3 . Find the magnitude per meter run and the point of application of the resultant thrust.
 5. Explain the procedure to conduct Standard Penetration Test in detail. Discuss the corrections to be applied on the observed N-value.
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