O.P.Code:23CE0119 | R23 | H.T.No.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. III Year I Semester Regular Examinations December-2025
GEOTECHNICAL ENGINEERING
(Civil Engineering)

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

**PART-A**

(Answer all the Questions **10 x 2 = 20** Marks)

| | | | | | |
|---|---|---|---|---|---|
| 1 | a | Define residual and transported soil. | CO1 | L1 | 2M |
| | b | Write the relationship between bulk density, dry density, and water content. | CO1 | L1 | 2M |
| | c | Define capillary rise in soils and write the formula for height of capillary rise. | CO2 | L1 | 2M |
| | d | What is quick sand condition? State the critical hydraulic gradient formula. | CO2 | L1 | 2M |
| | e | State two assumptions made in Boussinesq's theory of stress distribution | CO3 | L1 | 2M |
| | f | Briefly explain how Newmark's charts are used to determine vertical stress at a point. | CO3 | L1 | 2M |
| | g | Define primary consolidation and secondary consolidation in soils. | CO4 | L1 | 2M |
| | h | List two assumptions made in Terzaghi's 1-D consolidation theory. | CO4 | L1 | 2M |
| | i | Define cohesion (c) and angle of internal friction ($\phi$). | CO5 | L1 | 2M |
| | j | Write Mohr–Coulomb equation for shear strength and define its terms. | CO5 | L1 | 2M |

**PART-B**

(Answer all Five Units **5 x 10 = 50** Marks)

**UNIT-I**

| | | | | | |
|---|---|---|---|---|---|
| 2 | a | Explain in detail how soils are formed. | CO1 | L2 | 5M |
| | b | Briefly explain different types of soil structures which can occur in nature.mass. | CO1 | L2 | 5M |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 3 | | A soil sample has a porosity of 40%. The specific gravity of solids is 2.70. Calculate (a) void ratio, (b) dry density, (c) unit weight if the soil is 50% saturated and (d) unit weight if the soil is completely saturated. | CO1 | L3 | 10M |

**UNIT-II**

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|---|---|---|---|---|---|
| 4 | | Elaborate various factors affecting the permeability of soil. | CO2 | L2 | 10M |

**OR**

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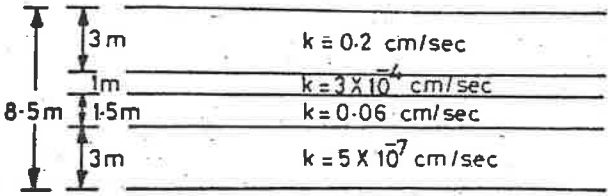
|---|---|---|---|---|---|
| 5 | | Figure shows a cross-section through the strata underlying a site. Calculate the equivalent permeability of the layered system in the vertical and horizontal direction. Assume that each layer is isotropic. | CO2 | L3 | 10M |






**UNIT-III**

| | | | | | |
|---|---|---|---|---|---|
| 6 | a | Discuss the basis of the construction of Newmark's influence chart. How it is used. | CO3 | L2 | |
| | b | A monument weighing 15 MN is erected on the ground surface. Considering the load as a concentrated one, determine the vertical pressure directly under the monument at a depth of 8 m below the ground surface. | CO3 | L3 | |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 7 | | An exaction 3 m x 6 m for foundation is to be made to a depth of 2.5 m below ground level in a soil of bulk unit weight 20 kN/m$^3$. What effect this exaction will have on the vertical pressure at a depth of 6 m measured from the ground surface vertically below the centre of foundation? IN for m = 0.43 and n = 0.86 is 0.10. | CO3 | L3 | |

**UNIT-IV**

| | | | | | |
|---|---|---|---|---|---|
| 8 | a | Differentiate between 'Compaction' and 'Consolidation'. | CO4 | L1 | |
| | b | State the assumptions made by Terzaghi for theory of one-dimensional Consolidation. | CO4 | L1 | |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 9 | | A compressible layer is expected to have total settlement of 15 cm under a given loading. It settles by 3 cm at the end of two months after the application of load increment? How many months will be required to reach a settlement of 7.5 cm? What is the settlement in 18 months? The layer has double drainage. | CO4 | L3 | |

**UNIT-V**

| | | | | | |
|---|---|---|---|---|---|
| 10 | a | Explain Mohr-Coulomb theory and draw the failure envelope. | CO5 | L2 | |
| | b | Sketch the stress-strain relationship for dense and loose sand. | CO5 | L2 | |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| 11 | | With the help of sketch explain how Direct Shear Test is conducted? What are its merits and demerits? | CO5 | L2 | |

*** END ***