

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)  
**B.Tech III Year I Semester Regular & Supplementary Examinations February-2024**  
**SOIL MECHANICS**  
(Agricultural Engineering)

**Time: 3 Hours****Max. Marks: 60**

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

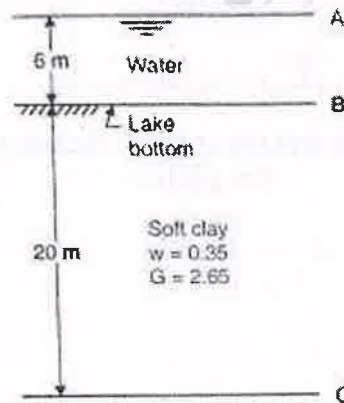
- |   |   |   |     |    |    |
|---|---|---|-----|----|----|
| 1 | a | Briefly explain different types of soil structures which can occur in nature.                     | CO1 | L1 | 6M |
|   | b | Define the terms void ratio, specific gravity of particles, degree of saturation and dry density. | CO1 | L1 | 6M |

**OR**

- |   |   |  |     |    |     |
|---|---|--|-----|----|-----|
| 2 | A test for the relative density of soil in place was performed by digging a small hole in the soil. The volume of the hole was 400 ml and the moist weight of the excavated soil was 9 N. After oven drying the weight was 7.8 N. Of the dried soil, 4N was poured into a vessel in a very loose state, and its volume was found to be 270 ml. The same weight of soil when vibrated and tamped had a volume of 200 ml. Determine the relative density. |  | CO1 | L3 | 12M |
|---|---|--|-----|----|-----|

**UNIT-II**

- |   |  |  |     |    |     |
|---|--|--|-----|----|-----|
| 3 | Compute the total, effective and pore pressure at a depth of 20 m below the bottom of a lake 6 m deep. The bottom of lake consists of soft clay with a thickness of more than 20 m. The average water content of the clay is 35% and the specific gravity of the soil may be assumed to be 2.65. |  | CO2 | L3 | 12M |
|---|--|--|-----|----|-----|

**Figure 3 – Lake Profile****OR**

- |   |  |  |     |    |     |
|---|--|--|-----|----|-----|
| 4 | Draw the neat sketch of Variable Head Permeameter and derive the equation for determining coefficient of permeability. |  | CO2 | L2 | 12M |
|---|--|--|-----|----|-----|

**UNIT-III**

- |   |   |  |     |    |    |
|---|---|--|-----|----|----|
| 5 | a | Elaborate on factors affecting compaction.         | CO4 | L1 | 6M |
|   | b | Describe the methods used in field for compaction. | CO4 | L1 | 6M |

**OR**

- |   |  |  |     |    |     |
|---|--|--|-----|----|-----|
| 6 | A sample of soil was prepared by mixing a quantity of dry soil with 10% by mass of water. Find the mass of this wet mixture required to produce a cylindrical, compacted specimen of 15 cm diameter and 12.5 cm deep and having 6% air content. Find also the void ratio and the dry density of the specimen if $G = 2.68$ . |  | CO4 | L3 | 12M |
|---|--|--|-----|----|-----|

**UNIT-IV**

- 7 a Describe various stages of consolidation of soils. **CO5 L1 6M**  
b Differentiate between normally consolidated and the overconsolidated soils. How would you determine the preconsolidation pressure? **CO5 L2 6M**

**OR**

- 8 Define the following items: **CO5 L1 12M**  
(i) Coefficient of compressibility  
(ii) Coefficient of volume change  
(iii) Compression index  
(iv) Expansion index  
(v) Recompression index

**UNIT-V**

- 9 a Explain Mohr-Coulomb theory and draw the failure envelope. **CO6 L1 6M**  
b Sketch the stress-strain relationship for dense and loose sand. **CO6 L1 6M**

**OR**

- 10 a Discuss the shear strength characteristics of cohesionless soils and cohesive soils. **CO6 L1 6M**  
b A series of direct shear tests was conducted on a soil, each test was carried out till the sample failed. The following results were obtained. **CO6 L3 6M**

<b>Sample No.</b>	1	2	3
<b>Normal stress (kN/m<sup>2</sup>)</b>	15	30	45
<b>Shear stress (kN/m<sup>2</sup>)</b>	18	25	32

Determine the cohesion intercept and the angle of shearing resistance.

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