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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Supplementary Examinations Feb-2021**

**GEOTECHNICAL ENGINEERING-I**

(Civil Engineering)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a Draw the structure of Kaolinite, Illite and Montmorillonite clay mineral groups and brief the salient point. 5M
- b A sample of clay soil of volume  $1 \times 10^{-3} \text{ m}^3$  and weight 17.62 N, after being dried out in an oven had a weight of 13.68 N. If the specific gravity of the particle was 2.69 find void ratio, saturated unit Weight, dry unit weight and water content. 7M

**OR**

- 2 a Define (i) Plasticity Index (ii) Shrinkage Index (iii) Liquidity Index 7M
- b A saturated soil sample has a water content of 25% and unit weight of  $20 \text{ KN/m}^3$ . Determine the Specific gravity of the solid particles, dry unit weight and void ratio. 5M

**UNIT-II**

- 3 a Define permeability & Darcy's law. How do you determine the permeability of a clayey soil in the Laboratory? 6M
- b Estimate the quantity of flow of water through a soil mass in a 300 sec period when a constant Head of 1m is maintained. The length of the sample is 150 mm and the cross sectional area is  $100 \times 100 \text{ mm}$ . The coefficient of permeability of the soil sample is  $1 \times 10^{-1} \text{ mm/s}$ . 6M

**OR**

- 4 a What is flow net? Describe its properties and applications. How to construct a flow net? 6M
- b Write an expression for determining permeability of soil by falling head permeameter and Explain the terms 6M

**UNIT-III**

- 5 a The soil from a borrow pit is at a bulk density of  $17.50 \text{ kN/m}^3$  and a water content of 12.3%. It is Desired to construct an embankment with a compacted unit weight of  $19.82 \text{ kN/m}^3$  at a water Content of 17%. Determine the quantity of soil to be excavated from the barrow pit and the amount of water to be added for every  $100 \text{ m}^3$  of compacted soil in the embankment. 7M
- b What are the factors that affect compaction? 5M

**OR**

- 6 a What do you understand by 'Pressure bulb'? Illustrate with sketches 6M
- b A concentrated load of 1500 kN acts vertically at the ground surface. Determine the vertical stress at A point which is at a depth of 5.0 and a radial distance of 2.5 m. 6M

**UNIT-IV**

- 7 a Define the terms (i) Compression Index (ii) coefficient of permeability 5M
- b Obtain the partial differential equation for the one-dimensional consolidation as Terzaghi, 7M

**OR**

- 8 a The settlement analysis (based on the assumption of the clay layer draining from top and bottom Surfaces) for a proposed structure shows 3 cm of settlement in four years and an ultimate Settlement of 10 cm. However, detailed sub-surface investigation reveals that there will be no Drainage at the bottom. For this situation, determine the ultimate settlement and the time required For 2.5 cm settlement. 8M
- b Listing the various assumptions 4M

**UNIT-V**

- 9 a A triaxial compression test on a cohesive sample cylindrical in shape yields the following effective Stresses:
- Major Principal stress ... 8 MN/m<sup>2</sup>
- Minor principal stress ... 2 MN/m<sup>2</sup> 12M
- Angle of inclination of rupture plane is 60° to the horizontal. Present the above data, by means of a Mohr's circle of stress diagram. Find the cohesion and angle of internal friction.

**OR**

- 10 a Briefly explain how you conduct the triaxial compression test 6M
- b A vane, 10.8 cm long, 7.2 cm in diameter, was pressed into a soft clay at the bottom of a bore hole. Torque was applied and the value at failure was 45 Nm. Find the shear strength of the clay on a Horizontal plane. 6M

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