Code No: **R1632012** **R16** SET - 1

III B. Tech II Semester Regular/Supplementary Examinations, August-2021

GEOTECHNICAL ENGINEERING – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (Part-A and Part-B)
2. Answer ALL the question in Part-A
3. Answer any **FOUR** Questions from **Part-B**

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PART –A **(14 Marks)**

1. a) Explain three-phase soil system with a sketch. [3M]
   b) What is the difference between U.S. and I.S soil classification systems? [3M]
   c) Write down the equation to determine coefficient of permeability by Variable head test. [2M]
   d) State any two uses of Newmark's influence chart. [2M]
   e) Define coefficient of volume compressibility. [2M]
   f) List of any two differences between Direct shear test and Unconfined compression test. [2M]

PART –B **(56 Marks)**

2. a) Discuss the structure and characteristics of Kaolinite and illite mineral groups. [7M]
   b) A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk unit weight of 1.90g/cc. The specific gravity of solids is 2.70. Determine the degree of saturation and void ratio. What will be the saturated unit weight of the sample? [7M]

3. a) What are the index properties? Name the Index properties of cohesionless soils and cohesive soils. [7M]
   b) A soil has plastic limit of 20% and plasticity index of 25%. If natural water content of soil is 10%, what is the liquidity index and consistency index? [7M]

4. a) Explain procedure for determining coefficient of permeability of soil, by Falling head permeameter. [7M]
   b) A 5m thick layer of saturated clay is overlain by sand 4m deep. The water table is 3m below ground surface. The saturated unit weights of clay and sand are 22kN/m^3 and 20kN/m^3 respectively. The unit weight of sand above water table is 17kN/m^3. Find the total and effective stress at the top and middle of clay layer. [7M]

5. a) Describe 2:1 distribution method in detail. [7M]
   b) Determine the vertical stress at a point P which is 3m below and at a radial distance of 3m from the vertical load of 100KN. Use Westergaard's Solution. Take v = 0.3. [7M]
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6. a) What are the assumptions of Terzaghi's one-dimensional consolidation theory? [7M]
   b) A saturated clay layer of 5m thickness takes 1.5 years for 50% consolidation, when drained on both sides. It's coefficient of volume change is $1.5x10^{-3}$ m^2/kN. Evaluate the coefficient of permeability of the soil. [7M]

7. a) Explain the standard triaxial shear tests with respect to various drainage conditions. [7M]
   b) A vane 10cm long and 8cm in diameter was pressed into soft clay at the bottom of a bore hole. Torque was applied and gradually increased to 450kg-cm when failure took place. Subsequently, the vane was rotated rapidly so as to completely disturb the soil. The remoulded soil was sheared at a torque of 180kg-cm. Determine the undrained shear strength of clay in both natural and remoulded states as well as the sensitivity of clay. [7M]

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