

III B. Tech II Semester Supplementary Examinations, April - 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) Define Relative compaction. [2M]
- b) What are the various consistency limits? [2M]
- c) Mention any two uses of flow nets. [2M]
- d) Differentiate between Boussinesq's and Westergaard's theory. [3M]
- e) Define degree of consolidation. [2M]
- f) List out any three demerits of direct shear test. [3M]

PART –B**(56 Marks)**

2. a) Write a detailed note on soil formation. [7M]
- b) Establish a relation between the specific gravity of solids(G), void ratio(e), degree of saturation(S), unit weight of water(γ_w) and bulk unit weight of soil (γ). [7M]
3. a) Define: i) Consistency index, ii) Flow index, iii) Toughness index. [7M]
- b) Laboratory sieve analysis was carried out on a soil sample using a complete set of standard IS sieves. Out of 600 gm of soil used in the test, 240 gm was retained on IS 600 μ sieve, 300 gm was retained on IS 500 μ sieve and the remaining was retained on IS 425 μ sieve. Classify the soil according to IS system. [7M]
4. a) What are the characteristics and uses of flow nets? [7M]
- b) A layer of saturated clay 5 m thick is overlain by sand 4 m deep. The water table is 3 m below the top surface. The saturated unit weights of clay and sand are 18 kN/m³ and 20 kN/m³ respectively. Above the water table, the unit weight of sand is 17 kN/m³ and $\gamma_w=9.81$ kN/m³. Determine the effective stress at a depth of 9m below the ground surface. [7M]
5. a) Explain the determination of vertical stress increase due to loading using Newmark's influence chart. [7M]
- b) Determine the vertical stress increase at a depth of 1.5 m beneath the centre of square footing of width 3 m and with intensity of loading is 200 kN/m². [7M]
6. a) Differentiate between normally consolidated and over consolidated clays. [7M]
- b) In a consolidation test, a fully saturated clay sample was subjected to a load of 500 kPa. After 12 hours, the average pore water pressure was found to be 200 kPa. Find out the time required for 50% consolidation to take place. Assume $T_v = \pi U^2/4$. [7M]

7. a) Write about Skempton's pore pressure coefficients. [7M]
b) The results of a series of CU tests on a clay soil and the following results were obtained. [7M]

Cell pressure (kN/m^2)	100	300	500
Deviator stress at failure(kN/m^2)	130	485	645
Pore water pressure at failure(kN/m^2)	48	140	290

Determine the shear strength parameters in terms of total as well as effective stresses.
