

III B. Tech II Semester Regular/Supplementary Examinations, October/November - 2020
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**

PART –A**(14 Marks)**

1. a) Draw a neat sketch of Montmorillonite clay mineral. [3M]
- b) What is the principle of hydrometer analysis? [2M]
- c) Briefly explain the capillarity phenomenon in soils. [2M]
- d) State any three assumptions of Westergaard's theory. [3M]
- e) Define the Over Consolidation Ratio. [2M]
- f) Explain the liquefaction phenomenon in soils. [2M]

PART –B**(56 Marks)**

2. a) What are the differences between the wet side of optimum and dry side of optimum? Explain. [7M]
- b) A soil has a porosity of 40%, specific gravity of solids as 2.5 and water content of 12%. Determine the water content corresponding to full saturation. Also, evaluate the weight of water required to be added to 1 m³ of this soil for full saturation. [7M]
3. a) Discuss the Unified soil classification system in detail. [7M]
- b) The results of laboratory tests of different soils are given below: [7M]

	Clay A	Clay B
Liquid Limit(%)	44	55
Plastic limit (%)	20	35
Natural water content, (%)	30	50

Which of the soils is more plastic? Which of them is the softer inconsistency? Explain.

4. a) What is quicksand condition? Derive the expression for the critical hydraulic gradient. [7M]
- b) The result of the constant head permeability test in fines sand is as follows: Area of the soil specimen = 90 cm², Length of the specimen = 320 mm, Constant head maintained = 460 mm, Flow of water through a specimen = 200 ml in 5 min. Determine the coefficient of permeability. [7M]
5. a) Discuss any one approximate method of determination of vertical stress. [7M]
- b) Three concentrated loads of 3000 kN, 1000 kN and 2000 kN, spaced at 4.5 m and 3.5 m between the first, second and third loads, are acting in one vertical plane at the surface of a soil mass. Calculate the resultant stress produced by these loads on a horizontal plane 1.5 m below the surface at points directly below the loads. [7M]

6. a) Explain in detail about the Virgin compression curve and Recompression curve. [7M]
b) An 8 m thick clay layer with single drainage settles by 120 mm in 2 years. The coefficient of consolidation for this clay was found to be $6 \times 10^{-3} \text{ cm}^2/\text{sec}$. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90 percent of this settlement. [7M]
7. a) Define the Critical void ratio. Compare the behavior of dense sands with that of loose sands under shearing conditions. [7M]
b) A sample of dry sand was subjected to a tri-axial test, with a confining pressure of 250 kN/m^2 . The angle of shearing resistance was found to be 36° . At what value of the major principal stress, the sample is likely to fail? [7M]
