

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-V EXAMINATION – WINTER 2025****Subject Code:3154007****Date:19-11-2025****Subject Name:Geotechnical Engineering****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Sketch the phase diagram for a soil and indicate the volumes and weights of the phases on it.	03
	(b) Draw the pattern of gradation curves for well graded sand and gap graded gravel assuming necessary scale.	04
	(c) Starting with the Mohr-Coulomb shear failure theory, discuss in detail the shear strength of soil.	07
Q.2	(a) Define the natural water content, liquid limit, plastic limit and shrinkage limit.	03
	(b) Explain the method of light compaction of soil as per the relevant IS code.	04
	(c) The porosity and degree of saturation of a soil sample are 0.60 and 35% respectively. For 50 m ³ volume of the soil sample, determine the volume of air.	07
OR		
	(c) A saturated sand sample has dry unit weight of 18 kN/m ³ , and specific gravity of 2.65. Find out the water content of the soil sample assuming unit weight of water as 10 kN/m ³ .	07
Q.3	(a) Write a detailed note on Montmorillonite.	03
	(b) A burrow pit has a dry density of 17 kN/m ³ . How many cubic meters of this soil will be required to construct an embankment of 100 m ³ volume with a dry density of 16 kN/m ³ ?	04
	(c) Define alluvial, lacustrine, marine, glacial, and aeolian soil deposits.	07
OR		
Q.3	(a) State the assumptions made in Terzaghi's theory of one-dimensional consolidation.	03
	(b) The following values of sand are given: D ₆₀ = 0.77 mm, D ₃₀ = 0.41 mm and D ₁₀ = 0.30 mm. Determine, C _u and C _c and state if it is a well graded or poorly graded soil?	04
	(c) Starting with all the relevant assumptions, derive the Laplace's Equation for two-dimensional seepage through soil.	07
Q.4	(a) Discuss the importance of the effective stress in soil.	03
	(b) A soil stratum consists of 3 layers of thickness 2m, 1.8m and 3m having the coefficient of permeability of 2.3 X 10 ⁻³ cm/s, 1.85 X 10 ⁻³ cm/s and 3.5 X 10 ⁻³ cm/s respectively. Estimate the average co-efficient of permeability in the direction i) parallel to the bedding plane ii) normal to the bedding plane.	04
	(c) Discuss in detail the procedure for constant head permeameter.	07

OR

- Q.4** (a) What do you understand by total stress, effective stress and pore water pressure of a soil mass? How are they related? **03**
- (b) Explain any one method to compute coefficient of consolidation. **04**
- (c) A soil stratum consists of two layers having thickness 5m and 6m respectively. The ground water table is at the surface. The saturated unit weights for the soil layers are computed as 1.92 Ton/m^3 and 2 Ton/m^3 . Draw the total stress, pore water pressure and effective stress diagrams for the soil stratum. **07**
- Q.5** (a) What are the drainage conditions used in tri-axial compression test? **03**
- (b) In a tri-axial test at failure, major principal stress was 180 kPa, minor principal stress was 100 kPa, and pore water pressure was 20 kPa. Compute the angle of shearing resistance for this soil sample. **04**
- (c) A UU test is carried out on a saturated normally consolidated clay sample at a confining pressure of 5 kg/cm^2 . The deviator stress at failure is 2 kg/cm^2 . Determine its total stress strength parameters. **07**
- OR**
- Q.5** (a) What are the assumptions made for calculating the earth pressure of a backfill? **03**
- (b) What are the different factors governing the stability of a slope? **04**
- (c) For a dry cohesionless infinite slope, how is the Factor of Safety calculated? **07**
