# GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V(NEW) EXAMINATION – SUMMER 2022

Subject Code:3154007   **Date:04/06/2022**
Subject Name:Geotechnical Engineering
Time:02:30 PM TO 05:00 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)**	Classify the soil based on its origin.	**03**
	(b)	Differentiate permeability and seepage.	**04**
	(c)	Explain how the knowledge of Geotechnical engineering is useful in Civil Engineering.	**07**
Q.2	**(a)**	Differentiate Boussinesq's and Westergaard's theory with respect to its application.	**03**
	(b)	Define the natural water content, liquid limit, plastic limit and shrinkage limit.	**04**
	(c)	Calculate the volume of air in the soil if its sample gives values of the porosity and the degree of saturation as 0.67 and 40% respectively. Take volume of the soil sample = For 60 m^3.	**07**

OR

	(c)	What will be the water content of the soil sample whose unit weight of water is 12 kN/m^3? The sample measured dry unit weight of 18 kN/m^3 with saturated condition. Take G=2.65.	**07**
Q.3	**(a)**	Explain the phase diagram for a soil.	**03**
	(b)	Determine C_u and C_c for the soil sample with below data. D_{60} = 0.81 mm, D_{30} = 0.37 mm and D_{10} = 0.35 mm. Decide the type of soil; well graded or poorly graded.	**04**
	(c)	A consolidation test gives the following results, Change in void ratio = From 0.80 to 0.40 Increase in stress increment = From 100 kPa to 250 kPa. Define and Compute 1) Coefficient of compressibility 2) Coefficient of volume compressibility 3) Compression index.	**07**

OR

Q.3	**(a)**	Differentiate Active and Passive earth pressure with sketches.	**03**
	(b)	Calculate the volume of the soil required to construct the embankment of 125 m^3 with a dry density of 16 kN/m^3 if a burrow pit of soil gave the dry density of 18 kN/m^3.	**04**
	(c)	Discuss in detail the procedure for falling head permeameter.	**07**
Q.4	**(a)**	Explain in brief: tri-axial compression test for UU condition.	**03**
	(b)	A soil stratum is shown in the figure with its detail. Estimate the average co-efficient of permeability in the direction 1) Parallel to the bedding plane	**04**

2) Normal to the bedding plane.

K = 2.5 x 10⁻³ cm/sec	3.5 m
K = 1.2 x 10⁻³ cm/sec	1.2 m
K = 3 x 10⁻³ cm/sec	2.5 m
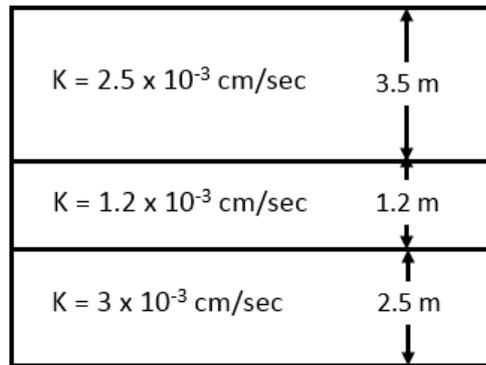
(c) Describe IS soil classification. **07**

OR

Q.4 **(a)** Explain primary and secondary settlement. **03**

(b) In a consolidated test a fully saturated clay sample was subjected to a load of 45 t/m². After 10 hours the average pore pressure was found to be 1.5 kg/cm². Find out the time it will take for 50% consolidation. **04**

(c) Show by diagram, distribution of pore water pressure, total stress an effective stress for a soil having two layers having thickness 3m and 7m respectively. The ground water table is at 1m below the surface. The saturated unit weights for the soil layers are computed as 18 kN/m³ and 21 kN/m³. **07**

Q.5 **(a)** Define Isochrone. **03**

(b) What are the different methods to determine the stability of the slope? **04**

(c) A soil particle is subjected to a maximum stress of 14.6 kN/m², minimum stress of -4.18 kN/m². Find the normal stress and the shear stress on a plane which is inclined at an angle of 50° with respect to the major principal stresses. Use either analytical or graphical method. Also find out the maximum shear stress that would be induced in that plane due to the loading condition. **07**

OR

Q.5 **(a)** Calculate Plasticity Index for a soil sample according the below data. **03**
Liquid Limit = 75%
Plastic Limit = 25%
Shrinkage Limit = 18 %
Sand = 20 %
Silt = 35 %

(b) Explain the tri-axial compression test with all the drainage conditions. Draw necessary sketches. **04**

(c) Explain types of failure of slopes with neat sketch. Also describe the type of soil in which they occur and state the remedies to prevent failure of soil. **07**

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