Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 3 – EXAMINATION – SUMMER 2026

Subject Code: 3130606 **Date: 03/07/2026**

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.**

Q.1	**(a)**	What is the importance of geotechnical engineering in various domain of Civil Engineering?	**03**
	(b)	Explain the terms: (i) hydraulic gradient (ii) Darcy's law	**04**
	(c)	Define the terms: (i) Water content (ii) Void ratio (iii) Degree of saturation. The porosity of a soil sample is 35%. Calculate the dry density and void ratio of soil mass. Take G= 2.7.	**07**
Q.2	**(a)**	Differentiate between compaction and consolidation.	**03**
	(b)	Discuss the methods of field compaction. How the clay is compacted in the field?	**04**
	(c)	Explain step by step procedure to perform permeability test for coarse grained soil in the laboratory with neat sketch.	**07**
		OR	
Q.2	**(c)**	Explain step by step procedure to perform liquid limit test in the laboratory with neat sketch.	**07**
Q.3	**(a)**	Write the Mohr-Coulomb equation of shear stress and explain terms involved in it.	**03**
	(b)	Write the equation of Boussinesq for stress distribution and explain each term involved in it.	**04**
	(c)	What is a flow net? What are its characteristics? Give the application of flow net.	**07**
		OR	
Q.3	**(a)**	Discuss the factors affecting compaction of soil mass.	**03**
	(b)	An unconfined cylindrical specimen of clay fails under an axial stress of 240 kN/m^2. The failure plane was inclined at an angle of 55 deg. to the horizontal. Determine the cohesion and angle of friction of soil mass.	**04**
	(c)	What is the importance of Newmark's chart? How it can be drawn? Write important points to be noted while using Newmark's influence chart.	**07**
Q.4	**(a)**	Differentiate between active earth pressure and passive earth pressure.	**03**
	(b)	Describe the factors affecting the shear strength of cohesion less soil.	**04**
	(c)	Explain the method of slice to find the factor of safety of a slope with neat sketch.	**07**
		OR	
Q.4	**(a)**	Describe common types of slope failure with neat sketch.	**03**
	(b)	What is the size of box shear test specimen and unconfined compression test specimen?	**04**
	(c)	What is the critical height of a slope? Explain Taylor's stability number in detail.	**07**
Q.5	**(a)**	Differentiate between strip footing and strap footing.	**03**

(b) Discuss the assumption made in the theory of consolidation by Terzaghi. **04**

(c) A footing 2.25 m square is located at a depth of 1.5 m in a sand of unit weight 18 kN/m^3.The shear strength parameters are C = 0 and Ø = 36°. Calculate (i) ultimate bearing capacity (ii) net ultimate bearing capacity and (iii) net safe bearing capacity of soil. Take F.S. = 3. N_c= 65.4, N_q = 49.4, $N\gamma$ = 54.0 **07**

OR

Q.5 **(a)** What are the objectives of soil exploration? **03**

(b) During the consolidation test, the void ratio is found to reduce from 0.90 to 0.50 under the stress increment of 100 kN/m^2 to 200 kN/m^2. Find (i) Coefficient of compressibility (ii) compression index. **04**

(c) In which conditions pile foundation is preferred? Explain group action of piles **07**

*****