Seat No./Enrollment No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 5 – EXAMINATION – SUMMER 2026

Subject Code: 3150615 **Date: 30/05/2026**

Subject Name: Soil Mechanics

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)** Define subsoil exploration and state its objectives **03**

(b) Write the importance of Shear strength in Civil Engineering. **04**

(c) List out various stages of Sub soil exploration and explain in details anyone. **07**

Q.2 **(a)** Explain the working principle of wash boring. **03**

(b) Draw split spoon sampler with its notations. **04**

(c) Explain Boussinesq's theory and its assumptions in detail. **07**

OR

Q.2 **(c)** A strip footing of 3 m width is placed at 3.5 m depth below Ground Level. Determine ultimate bearing capacity using (i) Terzaghi's Equation (Nc = 5.7 , Nq= 1 N_γ = 0)and (ii) IS Code method (Nc = 5.14 , Nq= 1 N_γ = 0). Take γ = 18 kN/m^3 and c= 15 kN/m^2. ϕ=0 . **07**

Q.3 **(a)** Write the limitation of Plate load test **03**

(b) Differentiate between general shear and punching shear failure. **04**

(c) A direct shear test was carried out on a soil sample and following results were obtained. **07**

Normal stress kN/m^2	150	200
Shear stress kN/m^2	110	120

Compute deviator stress if a triaxial test is carried out on the same soil with cell pressue of 150 kN/m^2.

OR

Q.3 **(a)** Explain the concept of isobars and pressure bulb. **03**

(b) Define adhesion factor. State its purpose in the design of piles in clay. **04**

(c) A point load of 150 kN acting at ground surface. Compute the vertical stress at 4 m depth along axis using Boussinesq's eqation and Westergaard's equation. **07**

Q.4 **(a)** Suggest methods to improve slope stability. **03**

(b) A 25 kN weight pile is inserted using single acting steam hammer with a free fall of 1.2 m. The avg. penetration of last 20 blow is 20 mm. Find the safe load using the ENR formula. **04**

(c) Describe lab vane shear test with neat sketch. **07**

OR

Q.4 **(a)** Define drift and shaft for direct method of exploration. **03**

(b) A vertical cut is made in a clay deposit having c= 30 kN/ m^2, ϕ=0 , γ = 17 kN/m^3. Determine the maximum depth of cut so that the cut is stable. Take S_n= 0.26 **04**

(c) Write down the Procedure for Shear strength determination using Direct shear test with neat sketch. **07**

Q.5 **(a)** Differentiate between End bearing pile and Friction pile. **03**

(b) Explain types of slope failure with sketches. **04**

(c) Describe Taylor's stability number and its use in slope analysis. **07**

OR

Q.5 **(a)** Give characteristics of Black cotton soil. **03**

(b) Enlist various pile driving hammers and explain any one. **04**

(c) Explain various functions of geosynthetics with suitable applications. **07**

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