

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3160616

Date: 03/06/2026

Subject Name: Foundation 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.**

- Q.1**
- (a) Enlist the objectives of soil investigation. **03**
 - (b) Differentiate between auger boring and wash boring. **04**
 - (c) Describe geophysical methods of explorations. **07**
- Q.2**
- (a) A builder wants to construct G +2 type residential unit in the plot, whose total area is 5000 m². The plot is in well develop area and rectangular in shape. Plan the exploration program. **03**
 - (b) Draw the sketch of standard spilt spoon sampler and labeled all the parts. **04**
 - (c) Illustrate standard penetration test with necessary corrections. **07**
- OR
- Q.2**
- (c) Illustrate direct method of soil investigation. **07**
- Q.3**
- (a) Describe Mayerhof's analysis. **03**
 - (b) Discuss the effect of eccentric loading on the Bearing capacity of soil **04**
 - (c) A 1.2 m wide footing is placed in dense sand at depth of 1.0 m. The soil properties are $C = 0$, $\gamma = 19 \text{ kN/m}^3$, $\phi = 35^\circ$. Take bearing capacity factor $N_c, 57.8, = N_q = 41.4$, and $N_\gamma = 42.4$. Determine the safe bearing capacity with Factor of safety 2.5. **07**
- OR
- Q.3**
- (a) Describe Skemton's Theory for N_c value. **03**
 - (b) Discuss contact pressure for rigid pavement on clayey soil. **04**
 - (c) A square footing with 1.8 m side is located at depth of 1.3 m. The soil has unit weight of 17 kN/m^3 , cohesion 10 kN/m^2 , $\phi = 30^\circ$. Take, factor of safety 3.0. $N_c, 37.2, = N_q = 22.5$, and $N_\gamma = 19.7$. Calculate the load carrying capacity of footing. **07**
- Q.4**
- (a) Illustrate the group efficiency of pile. **03**
 - (b) Describe pile load test. **04**
 - (c) A concrete pile 25 cm in diameter is driven into a dense sand up to 12.0 m depth. Estimate the safe load on pile with factor of safety 2.5. Take $\gamma = 21 \text{ kN/m}^3$, $K = 2.0$, $\tan \delta = 0.6$ and critical depth 5 m $N_q = 80$. **07**
- OR
- Q.4**
- (a) Describe under reamed pile. **03**
 - (b) Enlist the methods to determine load carrying capacity of pile foundation, and explain any one detail. **04**

- (c) A pile group consists of 15 pile of 300 mm diameter arraigned in 3 x 5 pattern. The center-to-center distance between piles are 900 mm. The depth of pile is 15 m. The soil is having cohesion 40 kN/m^2 . Neglect end bearing, determine load carrying capacity of pile group. Take adhesion factor 0.6. **07**

Q.5 (a) State the application of CNS layer in Expansive soil. **03**

- (b) A trapezoidal wall 0.9 m at top and 1.5 m at bottom is 4 m in height. The wall supports backfill up to full heights. The unit weight of the backfill is 18 kN/m^3 and that of wall is 25 kN/m^3 . Determine the FOS against overturning. Take $\phi = 30^\circ$. **04**

- (c) State the application of geosynthetics as a reinforcement with sketch. **07**

OR

Q.5 (a) Describe the characteristics of Kaolin, Montmorillonite, and Illite minerals. **03**

- (b) A cantilever sheet pile retains soil up to 6 m height. Determine the depth of zero pressure if unit weight is 18 kN/m^3 and $\phi = 30^\circ$. **04**

- (c) State the application of Geo-membrane as a fluid barrier with sketch. **07**
