

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VI EXAMINATION – WINTER 2025

Subject Code:3160616

Date:27-11-2025

Subject Name:Foundation 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) Differentiate between disturbed samples and undisturbed samples.	03
	(b) Explain the factors that affects sample disturbance.	04
	(c) Describe with a neat sketch wash boring method of sub soil exploration. What are its merits and demerits?	07
Q.2	(a) Define the terms: (i) Ultimate bearing capacity, (ii) Net ultimate bearing capacity (iii) Net safe bearing capacity	03
	(b) Differentiate between general shear failure and local shear failure.	04
	(c) Describe the major differences between SPT, SCPT and DCPT	07
OR		
	(c) The field N-value in a deposit of fully submerged fine sand was 38 at a depth of 5m. The avg. unit weight of sand is 17 kN/m ³ . Calculate corrected SPT value as per IS:2231-1981.	07
Q.3	(a) Define negative skin friction .How it affects the capacity of pile?	03
	(b) Write short note on under reamed pile.	04
	(c) A Circular footing of 2.5 m dia. Placed at a depth of 2m in a pure clay with an unconfined compressive strength of 140 kN/m ² , $\phi = 0$, and $\gamma = 16.5$ kN/m ³ . Determine the ultimate bearing capacity and safe bearing capacity . Assume Terzaghi's factors are $N_c=5.14$, $N_q=1$, $N_\gamma=0$ and FOS = 3.	07
OR		
Q.3	(a) Draw a sketch of Split spoon sampler with notations.	03
	(b) Write short note on pile driving equipments.	04
	(c) Determine the safe bearing capacity of a strip footing 2 m wide and 1.5 m depth resting on a dry sand bed. Consider $\gamma_{sand} = 18$ kN/m ³ and bearing capacity factor $N_c=35.5$, $N_q=20.5$, $N_\gamma =21$ corresponding to $\phi = 37$. Take FOS = 3.	07
Q.4	(a) Describe the swell test.	03
	(b) Explain application of Geo-synthetics in roads.	04
	(c) Determine the Safe load carrying capacity of a driven pile of 300mm dia and 8m length. In a medium dense to dense sand having $\phi = 35^\circ$, $\gamma = 20$ kN/m ³ , $\gamma' = 11$ kN/m ³ and water table at 3m below GL. Take FOS= 2, $k=2$, $\tan\delta = 0.5$ $N_q=60$.	07

OR

- Q.4** (a) Define: (i) Free swell index (ii) Swelling potential **03**
(b) Write short note on Drilled pier foundation **04**
(c) A drop hammer of 50 kN weight having an effective fall of 0.75m drives an RCC **07**
pile of 30 kN. The avg. penetration per blow is 15 mm. The total elastic
compression is 20 mm. Assuming the $e=0.20$ and FOS is 2.5, Determine the
ultimate bearing capacity and allowable load on pile. Use Hiley's Formula.

- Q.5** (a) Write short note on Group action and efficiency of pile group. **03**
(b) Discuss various types of anchors used for sheet pile wall. **04**
(c) Give classification of Geo-synthetics. Describe basic function of Geo- **07**
synthetics.

OR

- Q.5** (a) Write short note on Soldier piles and laggings. **03**
(b) Enlist types of retaining wall and explain any one in details. **04**
(c) Explain the procedure of Plate load test in details with neat sketch. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2024****Subject Code:3160616****Date:09-12-2024****Subject Name:Foundation 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) Provide information obtained in Reconnaissance survey.	03									
	(b) Enlist direct methods of exploration and explain Pits and Trench in brief.	04									
	(c) Illustrate wash boring method of exploration with neat sketch.	07									
Q.2	(a) Explain Dilatancy and Overburden pressure for SPT test.	03									
	(b) State the measures to be taken for treatment of expansive soil.	04									
	(c) Enlist different conditions for Combined footing and discuss any one in detail.	07									
OR											
	(c) Describe Grillage foundation.	07									
Q.3	(a) Enlist different foundation for Expansive soil and describe anyone.	03									
	(b) Differentiate between Counterfort and Cantilever type of retaining wall.	04									
	(c) Describe Geogrids with their application.	07									
OR											
Q.3	(a) Enlist minerals available in clayey soil and describe Montmorillonite.	03									
	(b) Enlist various forces acting on Gravity type retaining wall with its effect on stability.	04									
	(c) Describe Geomembrane with its application.	07									
Q.4	(a) State the Skempton's theory for cohesive soil.	03									
	(b) Differentiate between local and punching shear failure.	04									
	(c) A 1.5 m wide strip footing is placed at a depth of 1.2m in cohesionless soil. The water table is at 1.2 m. Determine safe bearing capacity with FOS 3. Take $\gamma = 17 \text{ kN/m}^3$, $\gamma_{\text{sat}} = 19 \text{ kN/m}^3$, and $\phi = 30^\circ$, $N_c = 37.2$, $N_q = 22.5$, $N_\gamma = 19.7$.	07									
OR											
Q.4	(a) State the bearing capacity equation given by IS 6403-1981, with details of each term.	03									
	(b) Enlist the assumptions made by Terzaghi in bearing capacity theory.	04									
	(c) Plate load tests were conducted in c – ϕ soil, on plates of two different sizes and following results were obtained. Find the size of square footing to carry a load of 800 kN.	07									
	<table border="0"> <thead> <tr> <th>Load</th> <th>Size</th> <th>Settlement</th> </tr> </thead> <tbody> <tr> <td>40 kN</td> <td>0.3 x 0.3 m</td> <td>25 mm</td> </tr> <tr> <td>100 kN</td> <td>0.6 x 0.6 m</td> <td>25 mm</td> </tr> </tbody> </table>	Load	Size	Settlement	40 kN	0.3 x 0.3 m	25 mm	100 kN	0.6 x 0.6 m	25 mm	
Load	Size	Settlement									
40 kN	0.3 x 0.3 m	25 mm									
100 kN	0.6 x 0.6 m	25 mm									

- Q.5** (a) Describe Displacement and Non-displacement Pile. **03**
(b) Differentiate between End bearing and Friction Pile. **04**
(c) A group of 3 X 3 piles 10 m long, and 300 mm diameter is used as foundation. The soil is having cohesion 70 kN/m^2 , adhesion factor 0.75. The spacing among the piles 800 mm. Calculate safe load of pile group with FOS 3. **07**

OR

- Q.5** (a) State the objectives of Sheet Pile. **03**
(b) Describe Under- Reamed pile. **04**
(c) A 15 m long 350 mm diameter pile is placed in dense sand. Determine the load carrying capacity of pile with FOS 3. Take $\gamma = 17 \text{ kN/m}^3$, and $\phi = 40^\circ$, $N_q = 135$, $K = 2.0$, $\tan\delta = 0.57$. Take $D_c = 20B$. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3160616****Date:15-12-2023****Subject Name: Foundation 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) Define the following terms: (1)Gross safe bearing capacity,(2) Net allowable Bearing Pressure, (3) Net safe settlement pressure	03
(b) What is reconnaissance? What type of information is obtained in reconnaissance?	04
(c) Explain the procedure for the design of a (1) Strip footing (2) spread footing.	07
 Q.2 (a) How would you fix the depth of foundation?	03
(b) What is negative skin friction? What is its effect on the pile?	04
(c) What are the assumption made in the derivation of Terzaghi's bearing capacity theory? Write the equation for the ultimate bearing capacity.	07
OR	
(c) Explain types of retaining walls with neat sketches.	07
 Q.3 (a) What are the conditions where a pile foundation is more suitable than a shallow foundation?	03
(b) Discuss the effect of water table on the bearing capacity of the soil.	04
(c) Enlist test for identification of expansive soil and explain any one.	07
OR	
Q.3 (a) Enlist various dynamic formula for determine pile capacity with their limitations.	03
(b) How would you decided the depth of exploration and the lateral extent of the investigations?	04
(c) Describe with a neat sketch wash boring method of sub-soil exploration. What are its merits and demerits?	07
 Q.4 (a) Explain anchors used in sheet pile walls.	03
(b) How do you ascertain whether a foundation soil is likely to fail in local shear or in general shear?	04
(c) Discuss standard penetration test. What are the various corrections? What is the importance of the test in geotechnical engineering?	07
OR	
Q.4 (a) What are the purpose of foundation?	03
(b) Discuss characteristics of expansive soils.	04
(c) Describe free swell test	07
 Q.5 (a) Enlist various pile driving hammers.	03
(b) Differentiate between general shear failure and local shear failure.	04
(c) Describe various types of pile foundations.	07
OR	

- Q.5** (a) Differentiate between strip footing and strap footing. **03**
(b) How would you estimate the group capacity of piles in (1) sand (2) clay? **04**
(c) Explain in details the types of failure of pile group. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI(NEW) EXAMINATION – WINTER 2022****Subject Code:3160616****Date:19-12-2022****Subject Name:Foundation 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) Explain about reconnaissance survey.	03
(b) Describe the split spoon sampler. What is its use?	04
(c) What are the methods available for sub-surface exploration? Explain any one in detail.	07
Q.2 (a) Define the terms for sampler.	03
(i) Inside clearance (ii) Outside Clearance	
(ii) (iii) Area Ratio	
(b) Differentiate between general shear failure and local shear failure,	04
(c) Discuss the Dynamic cone penetration test. What are its limitations?	07
OR	
(c) List various methods of flexible pavement design and explain CBR method.	07
Q.3 (a) Explain: floating foundation	03
(b) Discuss the merits and demerits of plate load test.	04
(c) A strip footing 1.5m wide, rest on the surface of a dry cohesionless soil having $\phi = 25^\circ$ and $\gamma = 18 \text{ kN/m}^3$. If the water table rises temporarily to the surface due to flooding, calculate the percentage reduction in the ultimate capacity of the soil. Assume $N_\gamma = 9.0$.	07
OR	
Q.3 (a) Write short note on: Negative skin friction.	03
(b) Enlist the situations where pile foundations are preferred.	04
(c) Describe Terzaghi's theory of bearing capacity of foundation soil under strip footing. What are the assumptions and its limitations?	07
Q.4 (a) Explain with neat sketch the function of Better pile and Friction pile	03
(b) Explain about efficiency of pile group.	04
(c) A Group of friction pile in clay consists of 12 piles of 500 mm dia. grouped as 4 x 3 spaces at 1m apart. If the undrained shear strength of clay is 7 kN/m ² and pile s are 15m long, estimate the group capacity of pile. Take adhesion factor as 1.0	07
OR	
Q.4 (a) Describe behavior of collapsible soils.	03
(b) How do you estimate the group capacity of piles in sand and clay ?	04
(c) A RCC pile of 35 kN weight, was driven by a drop hammer weighing 40 kN with a effective free fall of 1.0 m. The average settlement per blows is 1.0 cm. the total elastic compression is 1.5 cm. Assuming Coefficient of Restitution as 0.25 and FOS = 2.5. Determine ultimate bearing capacity and allowable load on pile.	07

- Q.5** (a) Write short note on: CNS layer. **03**
(b) Give applications of geosynthetics in roads. **04**
(c) Draw a neat sketch of gravity retaining wall showing forces acting on it. **07**
Explain stability checks for gravity retaining wall.

OR

- Q.5** (a) Explain how free swell index can be measured. **03**
(b) Explain anchors used in sheet pile walls. **04**
(c) Why drainage of the backfill is necessary? Explain different methods of providing drainage of retaining wall? **07**
