



GUJARAT TECHNOLOGICAL UNIVERSITY
SHANTILAL SHAH ENGINEERING COLLEGE, BHAVNAGAR
APPLIED MECHANICS DEPARTMENT

Subject: Foundation Engineering (Professional Elective – III)

Subject Code: 3160616

Semester: 6th Semester BE Civil Engineering

Last date of Submission of Assignments

Assignment No.	Name of Assignment	Last date of Submission
Assignment 1	Foundation classification and soil exploration/investigation	24/02/2023
Assignment 2	Shallow Foundation	10/03/2023
Assignment 3	Pile classifications & load transfer principle of pile foundation	24/03/2023
Assignment 4	Foundation on problematic soil & introduction to geosynthetic	21/04/2023
Assignment 5	Retaining walls and Diaphragm walls	12/05/2023



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Assignment No. 1 (Foundation Classification and Soil exploration/investigation)

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1. Enlist various types of Foundation and draw a neat sketch of each.
2. Write the name of factors affecting the selection of type of foundations.
3. Write the steps to choose the types of foundation based on soil condition.
4. Explain the purpose and procedure of sub soil Explorations.
5. Enlist various Geophysical soil Exploration Methods and explain any one in detail.
6. Enlist various sub soil exploration methods.
7. Explain disturbed and undisturbed samples. How to obtain undisturbed soil sample?
8. Describe split spoon sampler. What is its use?
9. Write detailed note on SPT and CPT test.
10. Write short note on amount of sub soil exploration.
11. Draw a typical Bore-Log of sub soil exploration.
12. Write short note on different types of soil sampler.



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Assignment No. 2 (SHALLOW FOUNDATION)

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Semester: 6th Semester BE Civil Engineering

1. Define the followings terms.
 - i. Foundation
 - ii. Footing
 - iii. Ultimate Bearing Capacity
 - iv. Net Ultimate Bearing Capacity
 - v. Net Safe Bearing Capacity
 - vi. Gross Safe Bearing Capacity
 - vii. Net Safe settlement Pressure
 - viii. Net Allowable Bearing Pressure
2. Write a note on Terzaghi's bearing capacity theory. What are the assumptions made in Terzaghi's bearing capacity theory?
3. Differentiate between shallow foundation and deep foundation.
4. Draw and explain types of shear failure of soil.
5. Enumerate the factors affecting bearing capacity and explain any two in detail.
6. Discuss plate load test. What are the limitations of plate load test?
7. Discuss bearing capacity from standard penetration test.
8. Discuss bearing capacity Based on IS- Code Method.
9. Write note on settlement of foundation.
10. Write note on immediate settlement of cohesive and cohesionless soil.
11. Write a note on Contact pressure under rigid and flexible footings.
12. Write note on bearing capacity of Mat/Raft Foundation.
13. Write a note on Proportioning of footing for equal settlement.
14. Write a note on presumptive bearing capacity of soil. Give presumptive bearing capacity of different types of soil strata based on IS Code: 1904-1978.
15. Write a note on settlement of foundation.

16. Write a note on coefficient of subgrade reaction.
17. Write a note on C.B.R test.
18. Explain methods to reduce foundation settlement.
19. Determine the ultimate bearing capacity of a strip footing, 1.2 m wide and having the depth of foundation of 1 m. use Terzaghi's theory and assume general shear failure, take $\phi' = 35^\circ$, $\gamma = 18 \text{ kN/m}^3$, and $c' = 15 \text{ kN/m}^2$. **Ans. 2070 kN/m².**
20. A footing 2 m square is laid at a depth of 1.3 m below the ground surface. Determine the net ultimate bearing capacity using IS Code method. take $\phi' = 30^\circ$, $\gamma = 20 \text{ kN/m}^3$, and $c' = 0 \text{ kN/m}^2$.
Ans. $q_{nu} = 1000 \text{ kN/m}^2$
21. A strip footing of 2 m width is founded at a depth of 4 m below the ground surface. Determine the net ultimate bearing capacity using (a) Terzaghi's equation (b) Kempton's equation and (c) IS code method. The unit weight of the soil is 20 kN/m^3 .
Ans. (a) Terzaghi's $q_{nu} = 57 \text{ kN/m}^2$ (b) Kempton's $q_{nu} = 70 \text{ kN/m}^2$ (c) $q_{nu} = 71.96 \text{ kN/m}^2$



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Assignment No. 3 (Pile Classifications & Load Transfer Principle of Pile foundation)

Subject: Foundation Engineering (Professional Elective – III)

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Semester: 6th Semester BE Civil Engineering

1. Classify the different types of pile.
2. Differentiate between pile foundation and shallow foundation.
3. What is negative skin friction? What is its effect on pile?
4. Discuss various dynamic formulas. What are their limitations?
5. Explain the method of load carrying capacity of a pile in Cohesionless and cohesive soil?
6. Write the note on estimation of the group capacity of piles in sand and clay?
7. Write a note on under reamed pile and also gives codal provisions for under reamed pile.
8. Enlist the methods of determination the pile capacity and explain any two.
9. Write a note on group action and efficiency of pile group.
10. Explain pile load test.
11. A square concrete pile 30 cm x 30 cm is driven in to homogeneous sand layer, ($\phi' = 30^\circ$, $\gamma = 18$ kN/m³) for a depth of 12 m. calculate the ultimate load. Take $K=1.3$, $\delta = 18^\circ$.
Ans: $Q_u = 611.81$ kN.
12. A group of friction pile in clay consists of 15 piles of 500 mm diameter grouped as 5x3 spaced at 1m apart. If the undrained shear strength of clay is 0.3 N/cm² and piles are 20 m long, estimate the group capacity and its efficiency.
Ans. Pile group capacity = 1143.75 kN and Pile group efficiency= 56.70%
13. A drop hammer weighing 50 kN and having an effective fall of 0.75 m drives an RCC pile weighing 35 kN. The average settlement per blow is 1.4 cm. the total temporary elastic compression is 1.8 cm. Assuming coefficient of restitution as 0.25 and factor of safety 2.5, determine ultimate bearing capacity and allowable load on pile.
Ans: ultimate bearing capacity= 1001.08 kN and allowable load= 400.4 kN.



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Assignment No. 4 (FOUNDATION ON PROBLEMATIC SOIL & INTRODUCTION TO Geosynthetic)

Subject: Foundation Engineering (Professional Elective – III)

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Semester: 6th Semester BE Civil Engineering

1. Discuss the characteristics of expansive soil.
2. Enlist tests for identification of expansive soils and explain any two in detail.
3. Explain the treatment method for expansive soil.
4. Enlist various types of foundation for black cotton soil. Explain any two in detail.
5. Explain concept of CNS layer.
6. Explain in detail (i) characteristics of collapsible soil (ii) behavior of collapsible soil
(iv) identification of collapsible soil (iv) treatment of collapsible soil
7. What is Geosynthetic? Give its types and functions.
8. Describe use of Geosynthetic in retaining walls.
9. Give applications of Geosynthetic in roads.



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Assignment No. 5 (Retaining walls and Diaphragm walls)

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Semester: 6th Semester BE Civil Engineering

1. Explain types of retaining walls with neat sketch.
2. Draw gravity retaining wall showing forces acting on it. Explain stability checks for gravity retaining wall.
3. Differentiate between cantilever retaining wall and counterfort retaining wall.
4. Why drainage of the backfill is necessary? Explain different methods of providing drainage of retaining wall.
5. What is sheet pile? Where it is used? Describe types of sheet piles.
6. Enlist forces acting on sheet piles.
7. Draw pressure distribution diagram of sheet piles.
8. Discuss types of anchors provided to sheet piles.
9. What is diaphragm wall? Give information necessary for the design and construction of diaphragm wall.
10. List methods of construction of diaphragm wall and explain any two.
11. Write short note on soldier piles and lagging.