

Faculty of Engineering

End Semester Examination May 2025

CE3CO33 Geotechnical Engineering -II

Programme	:	B.Tech.	Branch/Specialisation	:	CE
Duration	:	3 hours	Maximum Marks	:	60

Note: All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary.
 Notations and symbols have their usual meaning.

Section 1 (Answer all question(s))				Marks CO BL
Q1. The foundation of the structure is designed for-				1 1 1
<input checked="" type="radio"/> Shear failure of soil				
<input type="radio"/> Bending failure of soil				
<input checked="" type="radio"/> Compression failure of soil				
<input checked="" type="radio"/> Tension failure of soil				
Q2. The ultimate bearing capacity is-				1 1 1
<input type="radio"/> Always equal to safe bearing capacity				
<input type="radio"/> Less than safe bearing capacity				
<input checked="" type="radio"/> Greater than safe bearing capacity				
<input type="radio"/> Independent of soil type				
Q3. Which of the following is a static pile capacity formula?				1 2 1
<input type="radio"/> Hiley's formula				
<input checked="" type="radio"/> Terzaghi's bearing capacity equation				
<input type="radio"/> Engineering News formula				
<input type="radio"/> Both (a) and (b)				
Q4. Negative skin friction occurs when-				1 2 1
<input type="radio"/> The pile carries an upward load				
<input type="radio"/> The pile settles more than the surrounding soil				
<input checked="" type="radio"/> The surrounding soil settles more than the pile				
<input type="radio"/> There is no effect of soil movement on the pile				
Q5. Which of the following factors does NOT affect soil compaction?				1 3 1
<input type="radio"/> Water content				
<input checked="" type="radio"/> Atmospheric pressure				
<input type="radio"/> Type of compaction equipment				
<input type="radio"/> Soil type				
Q6. Which of the following is NOT a geosynthetic material?				1 3 1
<input type="radio"/> Geotextile				
<input type="radio"/> Geofoam				
<input checked="" type="radio"/> Geomembrane				
<input checked="" type="radio"/> Asphalt				
Q7. Which method is best for obtaining undisturbed soil samples?				1 3 1
<input type="radio"/> Auger boring				
<input checked="" type="radio"/> Shelby tube sampling				
<input type="radio"/> Trial pit excavation				
<input type="radio"/> Wash boring				
Q8. The Standard Penetration Test (SPT) is used to determine-				1 4 1
<input type="radio"/> Shear strength of cohesive soil				
<input type="radio"/> Water table level				
<input checked="" type="radio"/> Bearing capacity of rock				
<input checked="" type="radio"/> Soil density and resistance to penetration				
Q9. Machine foundations are primarily designed to withstand-				1 5 1
<input checked="" type="radio"/> Dynamic loads and vibrations				
<input type="radio"/> Earthquake loads only				
<input type="radio"/> Static loads only				
<input type="radio"/> Wind loads				
Q10. Bulkheads are primarily used for-				1 5 1
<input type="radio"/> High-rise building foundations				
<input type="radio"/> Electrical transmission lines				
<input checked="" type="radio"/> Highway pavement reinforcement				
<input checked="" type="radio"/> Marine and waterfront structures				

Section 2 (Answer all question(s))

Marks CO BL

Q11. Define Ultimate Bearing Capacity and Safe Bearing Capacity.

2 1 1

Rubric	Marks
Define Ultimate Bearing Capacity	1
Define Safe Bearing Capacity	1

Q12. Explain Terzaghi's bearing capacity theory for shallow foundations.

3 1 1

Rubric	Marks
Assumption of Terzaghi's Theory	1
Formulation of the equation	2

Q13. (a) A square footing ($2m \times 2m$) is placed at a depth of 1.5m in soil having Cohesion, $c = 25 \text{ kN/m}^2$, Unit weight, $\gamma = 19 \text{ kN/m}^3$, $\phi=25^\circ$, bearing capacity factors: $N_c=25.1$, $N_q=12.7$, $N_\gamma=9.7$, shape factors: $S_c=1.3$, $S_q=1.2$, $S_\gamma=0.8$ and Factor of Safety = 3. Find the Safe Bearing Capacity.

5 1 1

Rubric	Marks
Solution upto ultimate bearing capacity	2.5
Solution upto safe bearing capacity	2.5

(OR)

(b) A strip footing of 1.5 m width is placed at a depth of 1.2 m in a sandy soil having Cohesion, $c = 0$, Unit weight, $\gamma = 18 \text{ kN/m}^3$, Angle of internal friction, $\phi = 30^\circ$, bearing capacity factors: $N_q=22.5$, $N_\gamma=20$. Factor of Safety = 3. Find the Safe Bearing Capacity.

Marks CO BL

Q14. What is negative skin friction in piles? How does it affect pile capacity?

2 2 1

Rubric	Marks
What is negative skin friction in piles?	1
How does it affect pile capacity?	1

Q15. How is the load-carrying capacity of a single pile estimated in cohesionless and cohesive soils?

3 2 1

Rubric	Marks
Load-carrying capacity of a single pile estimated in cohesionless soil	1.5
Load-carrying capacity of a single pile estimated in cohesive soil	1.5

Q16. (a) A pile of 0.5m diameter and 10m depth is driven into sand having, unit weight, $\gamma = 18 \text{ kN/m}^3$, bearing capacity factor, $N_q=30$, friction coefficient, $K=0.8$, angle of friction $\phi=35^\circ$, skin friction factor, $f_s=20 \text{ kN/m}^2$. Find the Ultimate Load Capacity of a Pile in Cohesionless Soil.

5 2 1

Rubric	Marks
Formulation of the Ultimate Load Capacity	1
Solution upto Ultimate bearing capacity	4

(OR)

(b) What are the different methods for estimating pile capacity? Explain static and dynamic formulae.

Rubric	Marks
What are the different methods for estimating pile capacity?	2.5
Explain static and dynamic formulae.	2.5

Section 4 (Answer all question(s))

Q17. What is grouting in soil stabilization? Explain its types.

Marks CO BL

2 2 1

Rubric	Marks
What is grouting in soil stabilization?	1
Explain its types.	1

Q18. Explain different methods of soil compaction used in the field and laboratory.

3 3 1

Rubric	Marks
Field methods	1.5
Laboratory methods	1.5

Q19. (a) What is soil stabilization? Explain the types of stabilization techniques.

5 3 1

Rubric	Marks
What is soil stabilization	1
Explain the types of stabilization techniques.	4

(OR)

(b) Define geosynthetics and explain their types, functions, and materials.

Rubric	Marks
Define geosynthetics	1
Explain their types, functions, and materials.	4

Section 5 (Answer all question(s))

Q20. Discuss the Standard Penetration Test (SPT) procedure and its significance.

Marks CO BL

4 5 1

Rubric	Marks
Discuss the Standard Penetration Test (SPT) procedure	2.5
Significance of SPT test	1.5

Q21. (a) Explain different methods of soil exploration.

6 4 2

Rubric	Marks
Explain six methods of soil exploration	6

(OR)

(b) What are different types of soil samples? Explain sampling methods.

Rubric	Marks
What are different types of soil samples	2
Explain sampling methods.	4

Section 6 (Answer any 2 question(s))

Q22. What is a cofferdam? Explain its types and applications.

Marks CO BL
5 5 2

Rubric	Marks
What is a cofferdam	1
Explain its types and applications.	4

Q23. What are machine foundations? Discuss their classification and design considerations.

5 5 2

Rubric	Marks
What are machine foundations	1
Discuss their classification and design considerations.	4

Q24. What are sheet piles? Explain their classification, materials, and applications.

5 5 2

Rubric	Marks
What are sheet piles	1
Explain their classification, materials, and applications	4
