

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Marks Scored:

Level : B.E
Year : III

Course : CIEG 309
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date **AUG 12 2018**

SECTION "A"

[20Q. × 0.5=10 marks]

Encircle the most appropriate answer among the given choices.

1. Unit of Modulus of Sub-grade reaction is
a. kN/m^3 b. kN/m^2 c. kN/m d. kN/m^4
2. Major issues faced by foundations on Clay are
a. Differential Settlements c. Settlements
b. Seasonal expansion & Contraction d. Low Bearing Capacity
3. In spread footing foundations, geotechnical strength is expressed as the _____ of the soil.
a. Bearing capacity c. Sliding Capacity
b. Shear capacity d. Flexural capacity
4. Which of the followings cannot be classified as a Deep foundation System?
a. Piles b. Anchors c. Cassions d. Mats
5. _____ are employed usually where, because of soil conditions, economic or constructional considerations, it is desirable to transmit loads to strata beyond the practicable reach of spread foundations.
a. Pile Foundations c. Raft Foundations
b. Pad and beam foundations d. Strip Footings
6. The shear strength of a soil
a. Is directly proportional to the angle of internal friction of the soil
b. Is inversely proportional to the angle of internal friction of the soil
c. Decreases with increase in normal stress
d. Decreases with decrease in normal stress
7. The angle that Coulomb's failure envelope makes with the horizontal is called _____.
a. Cohesion c. angle of internal friction
b. Angle of repose d. critical angle
8. The intensity of active earth pressure at a depth of 10 meters in dry cohesionless sand with an angle of internal friction of 30° and with a weight of 1.8 t/m^3 , is _____.
a. 4 t/m^3 b. 5 t/m^3 c. 6 t/m^3 d. 7 t/m^3
9. The angle of internal friction of clays is usually,
a. 0° to 5° b. 5° to 20° c. 20° to 30° d. 30° to 45°
10. Failure of slope occurs only when total shear force is
a. Equal to total shearing strength c. Less than total shearing strength
b. Greater than total shearing strength d. Absence of shear wall in the slope

11. Select the correct statement.
 - a. A uniform soil has more strength and stability than a non-uniform soil
 - b. A uniform soil has less strength and stability than a non-uniform soil
 - c. Uniformity coefficient does not affect strength and stability
 - d. Uniformity coefficient of a poorly graded soil is more than that of a well graded soil
12. Rankine's theory of earth pressure assumes that the back of the wall is
 - a. Plane and smooth
 - b. Vertical and smooth
 - c. Plane and rough
 - d. Vertical and rough
13. Pile foundations are generally preferred to for
 - a. Bridge foundation
 - b. Residential buildings
 - c. Sky scrapper buildings
 - d. Runways
14. The rise of water table below the foundation influences the bearing capacity of soil mainly by reducing
 - a. Cohesion and effective angle of shearing resistance
 - b. Cohesion and effective unit weight of soil
 - c. Effective unit weight of soil and effective angle of shearing resistance
 - d. Effective angle of shearing resistance
15. Coefficient of earth pressure at rest is
 - a. Less than active earth pressure but greater than passive earth pressure
 - b. Greater than active earth pressure but less than passive earth pressure
 - c. Greater than both the active earth pressure and passive earth pressure
 - d. Less than both the active and passive earth pressures
16. The usual size of test pit is about the diameter of ... meters and the depth is limited to ... meters.
 - a. 0.5, 4
 - b. 1.5, 5
 - c. 1.5, 6
 - d. 2, 8
17. The area ratio of a sampling tube given the outside diameter of 100 mm and inside diameter of 94 mm is
 - a. 9.4 %
 - b. 10 %
 - c. 13.2 %
 - d. 26.4%
18. The best way to avoid damage from expansive soils is to:
 - a. give a shallow foundation
 - b. give a pile foundation
 - c. give foundation beneath the water zone
 - d. use of cobbles
19. During SPT Test, which of the following is NOT the condition for "Refusal"?
 - a. 50 blows are required for any 150 mm penetration
 - b. 100 blows are required for 300 mm penetration
 - c. 10 successive blows produce no advance
 - d. 5 successive blows produce no advance
20. Select the correct statement
 - a. Both negative skin friction and skin frictional resistance are caused by relative settlement of soil
 - b. Both negative skin friction and skin frictional resistance are caused by relative settlement of pile
 - c. Negative skin friction is caused by relative settlement of soil and skin frictional resistance is caused by relative settlement of pile.
 - d. Negative skin friction is caused by relative settlement of pile and skin frictional resistance is caused by relative settlement of soil

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F. M. : 40

SECTION "B"
[5Q × 8 = 40 marks]

Attempt *ALL* questions. Assume suitable data where necessary.

1. a. Why is it necessary to carry out geotechnical investigations? Describe the test procedure for Standard Penetration Test. [4]
b. What are the factors affecting the foundations? How would you select an appropriate foundation type? [4]
2. a. Explain earth pressure at rest, active earth pressure and passive earth pressure with necessary illustrations. [4]
b. What are the design criteria for piled foundation? Classify the types of Pile Foundation. [4]
3. A retaining wall with a smooth vertical back is 10 m high and retains a 2 layered sand backfill with the following properties:

Depth (m)	c (kN/m ²)	ϕ (degrees)	γ (kN/m ³)
0 – 5	0	30	18
Below 5	0	34	20

Show the active earth pressure distribution on the back of the retaining wall. Assume that the water table is well below the base of the wall. [8]

4. a. A rectangular footing 2 m by 3 m is placed at 2m depth in a deposit of cohesionless sand. The friction angle of the soil is 35°. The water table is located at the base of the foundation. The unit weight of the soil above the ground water table is 18 kN/m³ while below the ground water table is 20 kN/m³. Determine:
 - i. net ultimate bearing capacity
 - ii. the safe load for a safety factor of 3.0. The excavation is backfilled.
 The bearing capacity factors for strip footing for $\phi = 35^\circ$ are $N_q = 42$ and $N_\gamma = 43$. [4]
- b. The plan of a mat foundation with 6 columns is shown in the Figure 1. Assuming the mat to be rigid, determine the soil pressure distribution at points A, B, C and D. All the columns are of the size of 0.5 m × 0.5 m. [4]
5. A cantilever sheet pile wall is driven into a sand deposit having friction angle 35° and bulk unit weight of 22 kN/m³. One side of the sheet pile is backfilled to 3 m height. The backfill material is cohesionless sand having friction of 32° and bulk unit weight of 18 kN/m³. Using the simplified method determine the depth of penetration needed for the sheet pile to retain the backfill. Provide a safety factor of 2.0 for the passive region. The water table is below the base of the sheet pile. [8]



