KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.E.
Year : III

Course : CIEG 309
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 14 FEB 2025

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate option from each set of choices

1. Which exploration method is most commonly used for gravelly strata?
   a. Auger Boring b. Rotary Drilling c. Wash Boring d. Percussion Drilling

2. Recovery ratio of soil sample less than 1 indicates
   a. Expansion b. Good recovery c. Compression d. Bad Recovery

3. The depth of exploration in case of narrow concrete building having 7 Stories is
   a. 11.71 b. 10.51 c. 23.42 d. 21.03

4. The cone penetration resistance obtained in a clay soil in a CPT is $5000\ kN/m^2$. Determine the undrained strength of the clay. The total overburden pressure at the depth is $100\ kN/m^2$. Use cone factor for mechanical cone.
   a. $254\ kN/m^2$ b. $245\ kN/m^2$ c. $452\ kN/m^2$ d. $524\ kN/m^2$

5. Which is the correct relation?
   a. $Ka<Ko<Kp$ b. $Ka=Ko=Kp$ c. $Ka>Ko>Kp$ d. $Ka=Ko>Kp$

6. A vertical excavation was made in a purely cohesive deposit having unit weight of $20\ kN/m^3$. If the critical height is 4 m what is the value of Cohesion.
   a. $15\ kN/m^2$ b. $20\ kN/m^2$ c. $30\ kN/m^2$ d. $40\ kN/m^2$

7. Soil tends to compress horizontally in case of
   a. Active Case b. Passive Case
   c. Rest case d. Both Active and Passive case

8. Punching Shear Failure occurs in loose sand with Relative Density less than
   a. 70% b. 35% c. 50% d. 20%

9. Find q_u when $C = 40\ kN/m^2$, $N_c = 7$, $\gamma_1\ above\ the\ base = 18\ kN/m^3$, $\gamma_2\ below\ the\ base = 20\ kN/m^3$ $D_f = 1.5$, $N_q = 3, B = 1.5m, N_\gamma = 2$.
   a. $397\ kN/m^2$ b. $391\ kN/m^2$ c. $388\ kN/m^2$ d. $400\ kN/m^2$

10. Terzaghi's Bearing capacity factors N_c, N_q and N_γ are functions of:
    a. Angle of Internal Friction b. Angle of Internal Friction and Cohesion
    c. Cohesion d. Unit weight

11. The ultimate Bearing capacity (q_u) of cohesionless soil from Plate load test is determined as; (The parameters have usual meaning)

a. $q_u = q_u(p) * \frac{B_f}{B_p}$ b. $q_u = q_u(p)$ c. $q_u = q_u(p) * \frac{B_p}{B_f}$ d. $q_u = q_u(p).B_f$

12. Mat Foundation is used when

a. Area of individual column footing is more than 20% area of base
b. Area of individual column footing is more than 30% area of base
c. Bearing capacity of soil is very high
d. Area of individual column footing is more than 50% area of base

13. In cohesionless soil, the mat is designed according to the safe settlement pressure and not the bearing capacity (shear failure) except for very loose sand with corrected SPT 'N'

a. >5 b. =6 c. <5 d. <6

14. The efficiency of group pile is; where; n=$No.\ of\ piles\ in\ group$; $Q_u(g)$= Ultimate Load of group and $Qu(s)$= Ultimate Load of Individual Pile

a. $\eta = \frac{Q_u(g)}{n * Q_u(s)} * 100$ b. $\eta = \frac{Q_u(s)}{n * Q_u(g)} * 100$

c. $\eta = \frac{Q_u(g)}{Q_u(s)} * 100$ d. $\eta = \frac{Q_u(s)}{Q_u(g)} * 100$

15. The Load test on pile is done:

a. To determine the load settlement behaviour under working load.
b. To ascertain as a proof of acceptability.
c. Both a and b
d. To find the Angle of Internal Friction of Soil

16. In a working pile, the maximum test load should not exceed _____ times the design load.

a. 2.5 b. 1.5 c. 2.0 d. 3.0

17. For the drilled pier, the diameter of the size of shaft should be larger than

a. 1 m b. 0.5 m c. 2 m d. 0.6 m

18. The stability of cantilever sheet pile wall is provided by the following pressure developed below dredge level:

a. Active Pressure
b. Passive Pressure
c. Overburden Pressure
d. Pore water Pressure

19. Vibroflotation is used for

a. Compacting Purely cohesive soil
b. Compacting Granular soil only
c. Finding Cohesion
d. Finding Relative Density

20. Stone columns are

a. Used as Building Columns
b. Mostly used as Deep Foundation
c. Used to increase liquefaction risks
d. Used in mitigation of Liquefaction

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SECTION "B"

Attempt ALL questions. Assume suitable data if necessary.

1. When do we use Trapezoidal combined Footing? Explain with Figure. [2]

2. Differentiate Representative and Non Representative sample. [2]

3. The observed SPT value in a deposit of fine silty sand was 40. The test was conducted in a bore hole at a depth of 10 m from the ground surface where water table was at a depth of 4 m from the ground surface. The average void ratio of the deposit is 0.7. The soil above the water table may be assumed to be fully saturated. The specific gravity of the solids may be taken as equal to 2.7. Determine the corrected N for dilatancy and overburden pressure. [4]

4. A Retaining wall of 7.25m high has two layers of backfill. The soil supported consists of 4.5 m sand ($\gamma = 17.5\ kN/m^3, \phi = 30^\circ$) overlying saturated sandy clay ($\gamma = 19.25\ kN/m^3$, $\phi = 35^\circ, C = 16.6\ kN/m^2$). The GWT is at the upper surface of the sandy clay. Make a sketch of distribution of the active pressure on the wall. Calculate the total thrust per metre of the wall. [6]

5. A strip footing 2m wide carries a safe load intensity of 400 kN/m^2 at a depth of 1.2 m in sand. The saturated unit weight of sand is 19.5 kN/m^3 and unit weight above the water table is 16.8 kN/m^3. The shear strength parameters are C = 0 and $\phi = 35^\circ$. Take $N_q = 41.4$ and $N_\gamma = 42.4$ at $\phi = 35^\circ$. Determine the FoS w.r. to the shear failure when the Water Table is 2.5m below Ground Level. [5]

6. What are fully compensated and partially compensated Foundation? [2]

7. What are the limitations of Plate Load Test? [2]

8. When do we use Deep Foundation? Explain the types of Caisson Foundation. [1+3]

9. Differentiate Concrete and Steel Sheet Pile. [2]

10. What are the advantages of Preloading? [2]

11. What is Braced Excavation? A coffer dam is to be constructed of cantilever sheet piling. It has to retain a soil of bulk density of 2.3 g/cc and angle of internal friction 33° upto a height of 5m. Find the depth to which the piles should be driven, assuming that two third of the theoretical passive resistance is developed on the embedded length. [1+3]

P.T.O.

12. The plan of Mat foundation with columns (Loads in kN) is shown in figure. Assuming that the mat is rigid, determine the soil pressure distribution at points A, B, C and D; All the columns are of size 0.6 m by 0.6 m. Take L = 15 m ; B =13 m. [5]