KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

30 JUL 2024

Course : CIEG 309
Semester : II
F. M. : 40

SECTION "B"
[40 marks]

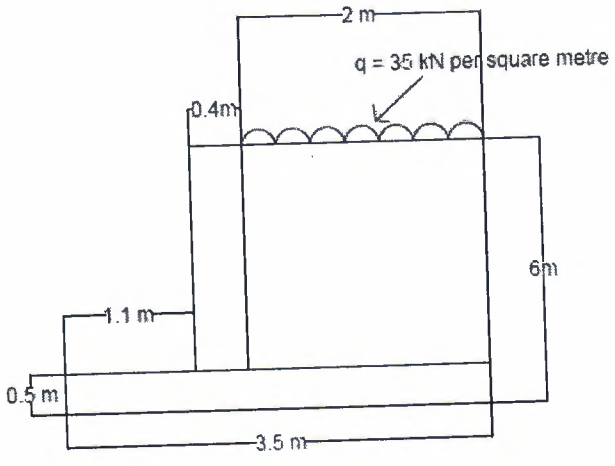
Attempt *ALL* questions.

1. What are strap footing and Mat Foundation? When do we use Mat Foundation? [1+1+2]

2. What are the four types of Boring? Explain any two of them. [1+3]

3. A SPT was performed at a depth of 25 m in a silty sand deposit with a unit weight of 19 kN/m^3. If the number of hammer blows recorded to drive first 100 mm is 15 and second 100 mm is 30 and third 100 mm is again 15, what is the N-value corrected for Overburden and Dilatancy.
The inner diameters of sampler are 73 mm and 75 mm. The outer diameters are 80 and 78 mm. Determine Inside clearance, outside clearance and area ratio of the sampler. [6]

4. Determine the maximum and minimum pressure under the base of the cantilever retaining wall as shown in figure below and also the Factor of Safety against sliding, overturning and bearing capacity ($Take\ q_{na} = 600\ kN/m^2$. The shear strength parameters of the soil are C = 0; $\phi = 41^\circ$. The unit weight of soil and concrete are 16 kN/m^3 and 24 kN/m^3 respectively. Neglect the water table. Take $\delta = 27^\circ$ on the base of the wall. [1+1+2+2+2]



5. Explain General shear failure. [2]

6. A strip footing of 1.5m width at its base at a depth of 1.2 m is resting on dry sand. The water table is 1 m below the base of the footing. Find the change in ultimate Bearing capacity of footing if the water table rises upto the depth 0.5 m below Ground level. Take $N_c = 95.7, N_q = 81.3\ and\ N_\gamma = 100.4, G = 2.7$ and dry unit weight of sand as 16 kN/m^3. [4]

P.T.O.

7. The 20mX30 m size mat is constructed at 3.5 m depth having basement for underground parking. The site consists of highly compressible saturated clay having cohesion of $30kN/m^2$. If the mat carries the total load of 57000 kNAu, calculate the FoS assuming γ=$18kN/m^3$. [4]

8. A group of nine piles, 12 m long and 300 mm in diameter is to be arranged in a square pattern in clay with Cohesion = 37.5 kN/m^2. Determine the centre to centre spacing of the piles for the efficiency of 1. Neglect the point bearing. Take $\alpha = 0.9$. [4]

9. Explain any two of the types of sheet pile. [2+2]

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Marks Scored:

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Time: 30 mins.
F. M. : 10
Registration No.:
Date 30 JUL 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

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

1. Which exploration method is commonly used for soft cohesive soil below water table?
   a. Auger Boring b. Wash Boring c. Rotary Drilling d. Percussion Drilling

2. For the good quality undisturbed sample, the value of Area ratio should be less than
   a. 40 % b. 30% c. 20% d. 50%

3. Recovery ratio of soil sample greater than 1 indicates
   a. Expansion b. Compression c. Good recovery d. None of the above

4. Which is the correct relation?
   a. $Ka<Ko<Kp$ b. $Ka>Ko>Kp$ c. $Ka=Ko=Kp$ d. None of the above

5. The critical height (Hc) of the unsupported vertical cut can be obtained using:
   a. $H_c = \frac{4C}{\gamma\sqrt{K_a}}$ b. $H_c = \frac{6C}{\gamma\sqrt{K_a}}$ c. $H_c = \frac{5C}{\gamma\sqrt{K_a}}$ d. $H_c = \frac{8C}{\gamma\sqrt{K_a}}$

6. Soil tends to stretch horizontally in case of
   a. Active Case b. Passive Case c. Rest case d. None of the above

7. Net ultimate Bearing capacity, q_{nu}, is given by;
   a. $q_u + \gamma D_f$ b. $q_u - \gamma D_f$ c. $q_u * \gamma D_f$ d. $\frac{q_u}{2}$

8. Local Shear failure occurs in soil of
   a. Low compressibility b. Medium compressibility
   c. High compressibility d. All of above

9. Find q_u when C = 50 $\frac{KN}{m^2}$, $N_c = 8, \gamma = 20\ kN/m^3$, $D_f = 2$, $N_q = 3, B = 1.5m, N_\gamma = 2$.
   a. 500 kN/m^2 b. 550 kN/m^2 c. 600 kN/m^2 d. None of the above

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

11. Plate Load Test is done to determine
    a. Unit weight of Soil b. Angle of Internal Friction
    c. Cohesion of Soil d. Ultimate Bearing capacity and Settlement

12. Mat Foundation is used when
    a. There is probable occurrence of Differential Settlement
    b. Area of individual column footing is more than 50% area of base
    c. Bearing capacity of soil is very low
    d. All of above

13. Baring capacity of Mat foundation in sand is generally governed by
    a. Shear Failure b. Settlement c. Both a and b d. None of above

14. Generally, Piles are used to
    a. Carry vertical compressive load b. Resist uplift load
    c. Resist horizontal or inclined load d. All of above

15. The maximum test load on working pile should not exceed
    a. 2.5 times the design load b. 3.5 times the design load
    b. 4.5 times the design load d. 1.5 times the design load

16. The type of caisson that has an open bottom but closed top.
    a. Open Caisson b. Box Caisson
    c. Pneumatic Caisson d. Well Foundation

17. Sheet pile walls are made up of:
    a. Timber b. RCC c. Steel d. All of above

18. The stability of cantilever sheet pile wall is provided by the following pressure developed below dredge level:
    a. Active Pressure b. Overburden Pressure
    c. Passive Pressure d. Pore water Pressure

19. The disadvantage of Preloading method of Ground Improvement is:
    a. Causes consolidation b. Increases Strength
    c. Time consuming d. Reduces compressibility

20. Generally size of stones used in stone columns are in the range of:
    a. 6 to 40 mm b. 40 to 80 mm
    c. 4.75 to 80 mm d. greater than 80 mm