Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

Level : B. E.
Year : III
Course : CIEG 303
Semester : I

Exam Roll No. :
Time: 30 mins.
F. M. : 10

Registration No.:
Date JUL 13 2017

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Mark "✓" in the appropriate answer.

1. Residual soils are formed by
   a. Glaciers b. Wind c. Water d. None of the above

2. Which one of the following experimentally determined values for a same soil sample is wrong?
   a. $\gamma = 18.4\ kN/m^3$ b. $\gamma_s = 26.1\ kN/m^3$
   c. $w = 40\%, S = 95\%$ d. $e = 1.12$

3. Select the correct statement
   a. Unit weight of dry soil is greater than unit weight of wet soil
   b. For dry soils, dry unit weight is less than total unit weight
   c. Unit weight of soil increases due to submergence in water
   d. Unit weight of soil decreases due to submergence in water

4. If the natural water content of a soil sample lies between LL and PL, soil is said to be in
   a. Plastic State b. Liquid State c. Semi-solid State d. Solid State

5. In a hydrometer analysis of fine grained soils,
   a. both meniscus and dispersing agent correction are additive
   b. both meniscus and dispersing agent correction are subtractive
   c. meniscus correction is additive and dispersing agent correction is subtractive
   d. meniscus correction is subtractive and dispersing agent correction is additive

6. In a specific gravity test if some air is entrapped in pycnometer + soil + water then the computed value of specific gravity G
   a. decreases due to increase in weight b. decreases due to decrease in weight
   c. increases due to increase in weight d. increases due to decrease in weight

7. Uniformity coefficient C_u for soil is
   a. < 1 b. $= 1$ c. ≤ 1 d. ≥ 1

8. Select the correct range of density index, ID
   a. $ID < 0$ b. $ID > 0$ c. $0 < ID < 1$ d. $ID \geq 1$

9. Ratio of energy applied in Modified Proctor Test to that applied in Standard Proctor Test is
   a. 4 b. 3 c. 4.5 d. 5

10. The hydraulic head that would produce a quick sand condition in a sand stratum of thickness 1.5 m, the specific gravity 2.67 and void ratio 0.67 is equal to
a. 1.5 b. 2 c. 2.5 d. 3

11. If k_x and k_z are the permeabilities in x- and z- directions respectively then equivalent permeability k_{eq} is given by
a. $k_{eq} = k_x/k_z$ b. $k_{eq} = \sqrt{k_x . k_z}$ c. $k_{eq} = k_x + k_z$ d. $k_{eq} = k_x . k_z$

12. For a clay deposit
a. C_v characterizes total settlement and C_c the time rate of settlement
b. C_c characterizes total settlement and C_v the time rate of settlement
c. Both C_c *and* C_v characterizes both aspects of settlement
d. C_v *and* C_c is not related to both aspects of settlement

13. In case of point load acting on the surface of soil mass, for a constant radial distance $(r \neq 0)$, and varying depth z, $(\sigma_z)_{max}$ will occur at
a. $r/z = 2/3$ b. $r/z = \sqrt{2/3}$ c. $r/z = \sqrt{2}/3$ d. $r/z = 2/\sqrt{3}$

14. The increase in soil stress from surface loads are
a. Porewater pressure b. Effective Stress
c. Total Stress d. All of the above

15. Empirical relation for compression index C_c for undisturbed clays is
a. $C_c = 0.009(LL - 10)$ b. $C_c = 0.09(LL - 10)$
c. $C_c = 0.9(LL - 10)$ d. $C_c = 9(LL - 10)$

16. A clay deposit suffers a consolidation settlement of $5cm$ with one way drainage. With two-way drainage, it suffers a settlement of
a. 10 cm b. 2.5 cm c. 20 cm d. 5 cm

17. Unconfined compressive strength test is
a. undrained test b. drained test
c. consolidated undrained test d. consolidated drained test

18. Angle that the Coulomb's failure envelope makes with horizontal is called
a. Cohesion b. Angle of friction c. Angle of repose d. None of the above

19. Shear strength of soil
a. is directly proportional to the angle of internal friction of soil
b. is inversely proportional to the angle of internal friction of soil
c. decreases with increase in normal stress
d. decreases with decrease in normal stress

20. Taylor's stability number N is given by
a. $N = \gamma . H/c_m$ b. $N = c_m/\gamma . H$ c. $N = c_m . H/\gamma$ d. $N = c_m . \gamma/H$

KATHMANDU UNIVERSITY
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JUL 1 3 2017

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Time : 2 hrs. 30 mins.

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Semester : I
F. M. : 40

SECTION "B"

Attempt *ALL* questions.

1. a. Starting from the relation of $\gamma_{sat}, G \text{ and } e$, show that, [2]

$$G = \frac{\gamma_{sat}}{\gamma_w - w_{sat}(\gamma_{sat} - \gamma_w)}$$

b. Sandy soil in a borrow pit has unit weight of solids as $25.8\ kN/m^3$, water content equal to $16.4\ kN/m^3$. How many cubic meter of compacted fill could be constructed of $3500\ m^3$ of sand excavated from the borrow pit if required value of porosity in the compacted fill is 30 %. Also calculate the change in Degree of saturation. [4]

2. a. Describe the various types of possible soil structures. [3]
b. The mass specific gravity of a fully saturated clayey soil with $w = 35\%$ is 1.9. On oven drying mass specific gravity drops to 1.75. Compute the true specific gravity of solids and Shrinkage Limit of soil. [3]

3. Define compaction curve. Discuss the differences between compaction and consolidation of soil. [1+3]

4. A one-dimensional consolidation test was performed on a sample, $50mm$ in diameter and $20mm$ high, taken from a clay layer $1m$ thick. During the test, drainage was allowed at the upper and lower boundaries. It took the laboratory sample 75 minutes to reach 50% consolidation. [2+2]
   a. If the clay layer in the field has the same drainage condition as the laboratory sample, calculate how long it will take the $1m$ clay layer to achieve 50% and 90% consolidation.
   b. How much more time would it take the $1m$ clay layer to achieve 50% consolidation if drainage existed on only one boundary?

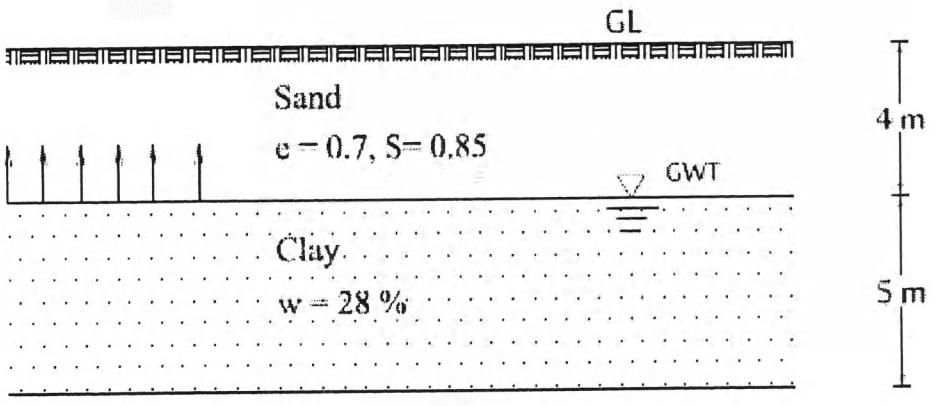
OR

Describe with neat sketch, the Standard Proctor Compaction Test and results obtained from it. [4]

5. A line load of 100 $kN/metre$ run extends to a long distance. Determine the intensity of vertical stress at a point 2 m below the surface and
   i. Directly under the load
   ii. At a distance of 2 m from the line. [4]

6. a. Discuss the validity of Darcy's law for seepage through soils.
What will be the ratio of equivalent permeability in horizontal direction to that in the vertical direction for a soil deposit consisting of three horizontal layers if the thickness and Coefficient permeability of second layer are twice that of first and those of third layer twice that of second. Assume $k_V = k_H$ for all layers. [2+3]

b. Plot the distribution of total stress, effective stress and pore water pressure with depth for the soil profile shown in the figure. Zone of capillarity extends upto ground level. [4]



7. Describe the procedure of Tri-axial Shear Test in soil and results obtained from the test. [4]

8. What types of slope failure are common in soils? Define various types of factor of safety. [3]