Roll No. | | | | | | | | |

B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV / DEC 2012

CIVIL ENGINEERING BRANCH

Fourth Semester

9

CE 9255 – Soil Mechanics

(Regulation 2008)

Time : 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. Draw the phase diagram for completely dry and fully saturated soils.
2. Two soil samples were compacted at same dry unit weight but different water contents. One sample has water content on dry of OMC while the other has water content on wet of OMC. Which one exhibit higher strength? Why?
3. Give the usual range of coefficient of permeability of Gravel, Sand, Silt and Clay.
4. What is flow net?
5. Describe the basis of the construction of Newmark's influence chart.
6. What is compression index?
7. Why was sand thought to be a 'friction-type' material? Can saturated sand exhibit angle of internal friction value of zero? Explain your answer.
8. What is meant by progressive failure? In which shear test does it take place?
9. How do you differentiate finite slopes and infinite slopes?
10. What is stability number?

Part – B (5 x 16 = 80 marks)

11. i) A soil specimen has a water content of 10% and a wet unit weight of 20 kN/m^3. If the specific gravity of solids is 2.70, determine the dry unit weight, void ratio, porosity and the degree of saturation. Take unit weight of water as 10 kN/m^3. (8)
    ii) Discuss briefly various factors affecting compaction. (8)

12. a) i) Discuss briefly various factors affecting permeability. (8)
    ii)The falling head permeability test was conducted on a soil sample of 4cm diameter and 18cm length. The head fell from 1.0m to 0.40m in 20 minutes. If the cross- sectional area of the stand pipe was 1cm^2, determine the coefficient of permeability. (8)

    OR

    b) i) Determine the average coefficient of permeability in the horizontal and vertical directions for a deposit consisting of three layers of thickness 5m, 1m and 2.5m and having the coefficients of permeability of $3x10^{-3}$cm/sec, $3x10^{-6}$cm/sec and $3x10^{-3}$cm/sec respectively. Assume the layers are isotropic. (10)
    ii) Explain the uses of a flow net. (6)

13. a) i) A uniform soil deposit has a void ratio 0.6 and specific gravity of 2.65. The natural ground water is at 2.5m below natural ground level. Due to capillary moisture, the average degree of saturation above ground water table is 50%. Determine the neutral pressure, total pressure and effective pressure at a depth of 6m. Draw a neat sketch of effective stress distribution from the ground level upto 6m depth. (8)

ii) Discuss in detail Terzaghi's theory of one dimensional consolidation. (8)

OR

b) i) A layer of soft clay is 6m thick and lies under a newly constructed building. The weight of sand overlying the clayey layer produces a pressure of 260kN/m^2 and the new construction increases the pressure by 100kN/m^2. If the compression index is 0.5, compute the settlement. Water content is 40% and specific gravity of grains is 2.65. (8)

ii) A ring foundation is of 3m external diameter and 2m internal diameter. It transmits a uniform pressure of 90kN/m^2. Calculate the vertical stress at a depth of 1.5m directly beneath the centre of the loaded area. (8)

14. a) i) A cylinder of soil fails under an axial vertical stress of 160kN/m^2, when it is laterally unconfined. The failure plane makes an angle of 50° with the horizontal. Calculate the value of cohesion and the angle of internal friction of the soil. (6)

ii) Explain in detail the direct shear test. (10)

OR

b) i) On which types of soils unconfined compression test is conducted? Explain with the help of Mohr circles how shear strength parameters are determined in this type of test. (8)

ii) A thin layer of silt exists at a depth of 18m below the surface of the ground. The soil above this level has an average dry density of 15.3kN/m^3 and average water content of 36%. The water table is almost at the surface. Tests on undisturbed samples of the silt indicate the following values. c'=35kN/m^2; ϕ'=27°. Estimate the shearing resistance of the silt on a horizontal plane. (8)

15. a) i) A slope of sandy soil extending to great extent is inclined at 20° to the horizontal. Determine the safety factor when a) the slope is dry and b) seepage occurs parallel to slope. The angle of shearing resistance of sand is 30° and the saturated unit weight of soil is 20kN/m^3. (8)

ii) Discuss the friction circle method for the stability analysis of slopes. Can this method be used for purely cohesive soil? (8)

OR

b) i) A 5m deep canal has side slopes of 1:1. The properties of soil are c_u=20kN/m^2, ϕ_u=10° and Saturated unit weight = 19.62kN/m^3. If Taylor's stability number is 0.108, determine the factor of safety with respect to cohesion, when the canal runs full. Also find the same in case of sudden drawdown, if Taylor's stability number for this condition is 0.137. (10)

ii) Discuss various methods for improving the stability of slopes. (6)

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