Reg. No. :

Question Paper Code: 41142

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fourth Semester

Civil Engineering

14UCE402 - SOIL MECHANICS

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. If the pores of a soil are completely filled with air, the soil is said to be

   (a) Wet soil   (b) dry soil
   (c) fully saturated soil   (d) partially saturated soil

2. Toughness index is the ratio of

   (a) Flow index and plasticity index   (b) plasticity index and flow index
   (c) liquidity index and flow index   (d) flow index and liquidity index

3. The rate of expulsion of pore fluid is directly dependent on the _____ of the soil.

   (a) Shear strength   (b) void ratio
   (c) permeability   (d) flow net

4. The possibility of quick sand condition will be there when flow of water to soil is

   (a) Horizontal   (b) upwards
   (c) downwards   (d) laterals

5. Compaction of a soil is measured in terms of

   (a) dry density   (b) specific gravity
   (c) compressibility   (d) permeability

6. In the derivation of Laplace equation, it is assumed that

    (a) soil is compressible   (b) soil is partially saturated

    (c) water is incompressible   (d) Darcy's law is not valid

7. In a shear box test, the failure plane is

    (a) weakest plane   (b) horizontal plane

    (c) vertical plane   (d) major principle plane

8. The sensitivity of a normal clay is about

    (a) 1 to 4   (b) 4 to 8   (c) 8 to 15   (d) 15 to 20

9. Stability of an infinite slope is lowest for

    (a) Partially saturated soil   (b) Dry soil

    (c) seepage parallel to slope   (d) Horizontal seepage

10. The process of maintaining or improving the performance of a soil as a constructional material, usually by the use of admixtures, is known as

    (a) soil exploration   (b) soil stabilization

    (c) soil compaction   (d) consolidation

PART - B (5 x 2 = 10 Marks)

11. Draw three phase diagram of soil.

12. What is Discharge velocity?

13. What are the Components of Settlement?

14. Draw neatly the Mohr's circle of stresses.

15. What are the types of slope failure?

PART - C (5 x 16 = 80 Marks)

16. (a) A soil sample has a mass of 2290 g and a volume of 1.15×10^{-3} m^3. After being completely dried in an oven, the mass of the sample is 2035g. The value of G for the soil is 2.68. Determine the bulk density, unit weight, water content, void ratio, porosity, degree of saturation and air content .   (16)

Or

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(b) A saturated soil sample has a volume of 20 cm^3. Given Liquid limit= 42% , Plastic Limit= 30% , Shrinkage Limit= 17% , Gs = 2.74. Find the minimum volume the soil can attain. (16)

17. (a) The water table in a certain area is at a depth of 4m below the ground surface. To a depth of 12m, the soil consists of very fine sand having an average voids ratio of 0.7. Above the water table the sand has an average degree of saturation of 50%. Calculate the effective pressure on a horizontal plane at a depth 10m below the ground surface. What will be the increase in the effective pressure if the soil gets saturated by capillarity upto a height of 1m above the water table? Assume G = 2.65. (16)

Or

(b) Explain how the coefficient of Permeability of Stratified soil Deposits is found. (16)

18. (a) A stratum of normally consolidated clay 7m thick is located at a depth of 12m below ground level. The natural moisture content of the clay is 40.5% and its liquid limit is 48%. The specific gravity of the solid particles is 2.76. The water table is located at a depth of 5m below ground surface. The soil is sand above the clay stratum. The submerged unit weight of the sand is 11 kN/m^3 and the same weighs 18 kN/m^3 above the water table. The average increase in pressure at the centre of the clay stratum is 120 kN/m^2 due to the weight of a building that will be constructed on the sand above the clay stratum. Estimate the expected settlement of the structure. (16)

Or

(b) Explain with a neat sketch Newmark's influence chart for determining vertical stress at any point under uniformly distributed load. (16)

19. (a) A specimen of clean, dry, cohesion less sand is tested in shear box and the soil failed at a shear stress of 40 kN/m^2 when the normal load on the specimen was 50 kN/m^2. Determine
    (i) the angle of shearing resistance,
    (ii) the principal stress during failure,
    (iii) the direction of the principal planes with respect to the direction of the plane of shearing. (16)

Or

(b) Describe the triaxial shear test and what are the advantages of triaxial shear test over the direct shear test. (16)

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20. (a) Explain in detail the friction circle method of stability analysis for slopes with neat sketch. (16)

Or

(b) (i) Calculate the factor of safety with respect to cohesion, of a clay slope laid at 1 in 2 to a height of 10m, if the angle of internal friction $\phi = 10°$; $c = 25$ kN/m^2 and $\gamma = 19$ kN/m³. What will be the critical height of the slope in this soil? (8)

(ii) Describe stability analysis of infinite slopes for cohesion less soil. (8)

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