A   Reg. No. :

Question Paper Code: 54105

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fourth Semester

Civil Engineering

15UCE405-SOIL MECHANICS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The particle size range of sand is   CO1- R

    (a) >30mm   (b) 0.002 - 0.075mm   (c) 0.075 – 4.75 mm   (d) < 0.002 mm

2. Alluvial deposits is the soil transported by   CO1- R

    (a) Gravity   (b) Wind   (c) Stream and river   (d) Glacier

3. The particle size which affects soil permeability is   CO2- R

    (a) D_{10} (b) D_{30} (c) D_{60} (d) D_{70}

4. In a flow net, flow lines and equipotential lines   CO2- R

    (a) Are parallel to each other   (b) Are perpendicular to each other

    (c) Intersect each other at 45°   (d) Intersect each other at 60°

5. Compaction is due to   CO3- R

    (a) Reduction of air voids   (b) Expulsion of pore water

    (c) Both (a) and (b)   (d) Reduction of soil solids particle size

6. Shear strength of soil increases with increase in   CO3- R

    (a) Cohesion of soil   (b) Angle of internal friction

    (c) Normal stress on soil   (d) All the above

7. In a triaxial test when the drainage is allowed initially only and not during latter stage, the test is known as CO4- R

   (a) Consolidated drained test   (b) Consolidated undrained test

   (c) Unconsolidated drained test   (d) Unconsolidated undrained test

8. The vane shear test is used to determine the in-situ undrained shear strength of intact fully saturated CO4- R

   (a) Clays   (b) Sands   (c) Gravels   (d) Highly organic soil

9. In a slope stability analysis by friction circle method, the radius of friction circle is given by CO4- R

   (a) $R\cos\Phi$ (b) $R\sin\Phi$ (c) $R\tan\Phi$ (d) $R\cot\Phi$

10. Failure of stability of slopes generally occurs along CO5- R

    (a) A vertical surface   (b) Horizontal surface

    (c) Curved surface   (d) All the surfaces

PART – B (5 x 2= 10 Marks)

11. Write the relationship between degree of saturation, specific gravity, water content and void ratio. CO1- R

12. What is quick sand condition? Under what circumstances can it occur? CO2- U

13. Define coefficient of consolidation. CO3-R

14. Write any two limitations of direct shear test CO4- R

15. Differentiate the modes of failure of infinite slope and finite slope CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) A partially saturated soil from an earth fill has a natural water content of 19% and a bulk unit weight of 19.33 kN/m^3. Assuming the specific gravity of soil solids as 2.7, compute the degree of saturation and void ratio. If subsequently the soil gets saturated, determine the dry density, buoyant unit weight and saturated unit weight. CO1- App   (16)

Or

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(b) How would you distinguish if a material is : CO1- App (16)

(1) GW or GP or GM or GC

(2) SW or SP or SM or SC

17. (a) Determine the neutral and effective stress at a depth of 16 m CO2- App (16)
below the ground level for the following conditions: Water table
is 3 m below ground level ; $G = 2.68$; $e = 0.72$; average water
content of the soil above water table is 8%.

Or

(b) Explain the properties and applications of flow nets CO2- U (16)

18. (a) Discuss the effect of compaction on various engineering CO3- U (16)
properties of soils.

Or

(b) There is a bed of compressible clay of 4 m thickness with CO3- U (16)
pervious sand on top and impervious rock at the bottom. In a
consolidation test on an undisturbed specimen of clay from this
deposit 90% settlement was reached in 4 hours. The specimen
was 20 mm thick. Estimate the time in years for the building
founded over this deposit to reach 90% of its final settlement.

19. (a) Two samples of a soil were subjected to shear tests. The results CO4- U (16)
were as follows :

Test No.	σ_3 kN /m^2	σ_1 kN /m^2
1	100	240
2	300	630

If a further sample of the same soil was tested under a minor
principal stress of 200 kN/m^2, what value of major principal
stresscan be expected at failure?

Or

(b) Explain the direct shear test to determine the shear strength of CO4- U (16)
soil.

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20. (a) Find the factor of safety of a slope of infinite extent having a   CO5-Ana   (16)
slope angle = 25°. The slope is made of clay having
$c' = 30$ kN /m^2 , $\varphi' = 20°$, γ b = 17.24 kN /m^3 and
γ sat = 19.14 kN /m^3 under the following conditions :

(1) when the soil is dry,

(2) when water seeps parallel to the surface of the slope, and

(3) when the slope is submerged. Assuming slip plane has to be developed at a depth of 4 m.

Or

(b) Explain friction circle method of slope stability analysis.   CO5- U   (16)

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