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Question Paper Code: 94102

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Fourth Semester

Civil Engineering

19UCE402- SOIL MECHANICS

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

PART A - (5x 1 = 5 Marks)

Answer All Questions

1. The specific gravity of Sandy soil is... CO1- U
(a) 1.2 (b) 1.8 (c) 2.2 (d) 2.7
2. The permeability is inversely proportional to _____ CO1- U
(a) Viscosity (b) Specific gravity (c) Temperature (d) None of the above
3. Weight of Hammer used in Standard Proctor Test CO1- U
(a) 2.6 Kg (b) 4.6 Kg (c) 8 Kg (d) 12.5 Kg
4. The expansion of soil due to shear at constant value of pressure is CO1- U
called
(a) apparent cohesion (b) true cohesion (c) dilatancy (d) consistency
5. The toe failure occurs at an angle CO1- U
(a) greater than 53° (b) less than 53° (c) equal to 43° (d) None of the above

PART – B (5 x 3= 15Marks)

6. Determine bulk unit weight of fully saturated soil if $e = 0.4$, $w = 20\%$ and $G = 2.65$ CO6- E
7. Determine the value of critical hydraulic gradient for a loose sand deposit having void ratio of 0.67 and specific gravity of 2.67. CO6- E
8. Illustrate the test methods for compaction CO1- U

9. The laboratory results obtained from direct shear test. The normal stress at failure is 200 kPa and shear stress is 50 kPa. Calculate the angle of internal friction of the soil. CO2-App
10. Illustrate the forces acting on sliding wedge in friction circle method. CO2- App

PART – C (5 x 16= 80Marks)

11. (a) Soil is to be excavated from a borrow pit which has a density of 1.75gm/cc and water content of 12%. The specific gravity of soil particles is 2.7.the soil is compacted so that water is 18%and dry density I 1.65gm/cc for 1000m³ of soil in fill, estimate CO6-E (16)
- i) the quantity of soil to be excavated from the pit in m³;
- ii) The amount of water to be added.

Also determine the void ratio of soil in borrow pit and fill

Or

- (b) Soil is to be excavated from a borrow pit which has a density of 2 gm/cc and water content of 14%. The specific gravity of soil particles is 2.7.the soil is compacted so that water is 20%and dry density 1.9gm/cc for 1000m³ of soil in fill, estimate CO6-E (16)
- (i) the quantity of soil to be excavated from the pit in m³;
- (ii) The amount of water to be added.

Also determine the void ratio of soil in borrow pit and fill

12. (a) The water table in an certain area is at a depth of 4m below the ground surface to a depth of 12m of the soil consist of very fine sand ,having an average void ratio of 0.7 above water table the sand has an average degree of saturation of 50%. Estimate the effective pressure on a horizontal plane at a depth of 10m below the ground surface , what will be the increase in effective pressure , if the soil gets saturated by capillarity, up to a height of 1m above the water table ,Assume G = 2.65. CO6-E (16)

Or

- (b) Discuss about quick sand condition and State the reason for Quick sand condition and its effect CO1- U (16)

13. (a) Describe about the standard proctor compaction test and modified proctor compaction test CO1- U (16)
- Or
- (b) Derive the expression for coefficient of consolidation using Terzaghi's one dimensional consolidation theory CO1- U (16)
14. (a) Demonstrate the Triaxial shear test. State advantages of triaxial test CO1- U (16)
- Or
- (b) The properties of soil in a 3m high embankment are $C' = 50 \text{ kN/m}^2$, $\phi' = 20^\circ$ and $\gamma = 16 \text{ kN/m}^3$. Skempton's pore water pressure parameters are found from triaxial test as $A = 0.5$ and $B = 0.9$. The height of embankment was raised from 3m to 6m. Assuming that the dissipation of pore pressure during this stage of construction is negligible and that lateral pressure is half of vertical pressure, Estimate the shear strength of soil at base of embankment just after increasing the height of embankment. CO6- E (16)
15. (a) (i) A 25 m high earth dam is to be built from a soil having an effective angle of internal friction of 30° and a cohesive strength of 20 kN/m^2 . The compacted moist unit weight of the soil is 19 kN/m^3 and the saturated unit weight is 20.2 kN/m^3 . Calculate the steepest angle at which the upstream slope of the dam may be inclined to the horizontal, for a factor of safety of 1.3 CO5-U (10)
- (ii) A natural slope in a $c-\phi$ soil is inclined at 12° to the horizontal. The water table is at the surface and the seepage is parallel to the slope. If a plane slip has developed at a depth of 4m, determine the factor of safety ($c = 8 \text{ kN/m}^2$, $\phi = 22^\circ$ and $\gamma_{\text{sat}} = 19 \text{ kN/m}^3$), CO6-E (6)
- Or
- (b) Interpret the stability analysis of an infinite slopes of Cohesion less soils CO6-E (16)

