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Question Paper Code: U4102

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

Fourth Semester

Civil Engineering

21UCE402- SOIL MECHANICS

(Regulations 2021)

Duration: Three hours

Maximum: 100 Marks

Answer All Questions

PART A - (5 x 1 = 5Marks)

1. The soil deposit transported through to lake CO1- U
(a) lacustrine soil (b) Alluvial soil (c) Both b And d (d) Marine soil
2. Which property of the soil is controlled by the effective stress? CO1- U
(a) shear strength (b) compressibility (c) Permeability (d) All the above
3. If the current effective stress is less than the pre-consolidation stress, CO1- U
then the soil is said to be.....
(a) over-consolidated (OC). (b) normally consolidated (NC)
(c) both a & b (d) None of these
4. Which of the following parameters used to estimate the angle of internal friction CO1- U
of a sandy soil
(a) Particle size (b) Roughness of particle
(c) Density index (d) Particle size distribution
5. If tension cracks develops and water enters the crack, then the hydrostatic CO1- U
pressure acts at a height of
(a) $h/2$ (b) $h/3$ (c) $h/4$ (d) none of the above

PART – B (5 x 3= 15Marks)

6. Draw the particle size distribution curve for a soil CO1- App
7. Discuss Darcy's law with its limitations. CO1- U

8. Write down the assumptions for Terzaghi's one dimensional consolidation theory. CO1- U
9. A cut depth 10m is made in a cohesive soil deposit ($c=30 \text{ KN/m}^2$, $\Phi = 0$ and $\gamma = 19 \text{ kN/m}^3$). There is a hard stratum under the cohesive soil at a depth of 12m below the original ground surface. If the required factor of safety is 1.50, determine the safe depth. CO3- App
10. List the different type of slopes CO1- U

PART – C (5 x 16= 80Marks)

11. (a) Describe in detail about the grain size distribution method use for coarse grained soil ($>75\mu$), And also for fine grained soil ($<75\mu$). CO1- U (16)
- Or
- (b) Discuss about the following soil classification system CO1- U (16)
- i. Unified soil classification system
 - ii. Indian Soil classification system.
12. (a) Explain permeability & discuss the factors affecting permeability of soil in detail CO1- U (16)
- Or
- (b) Discuss the assumptions of Boussinesq and Westerguard theory and also the expression for vertical stress due to point load . CO1- U (16)
13. (a) A 1m thick laboratory soil sample reaches 60% consolidation in 32.5secs under double drainage condition. Calculate how much time will be required for a 10 m thick layer in the field to reach the same degree of consolidation if it has drainage face on one side only. CO3- App (16)
- Or
- (b) A soil sample 20mm thick takes 20 minutes to reach 20% consolidation .estimate the time taken for a clay layer 6m thick to reach 40% consolidation . Assume double drainage in both cases. CO3- App (16)

14. (a) A cylindrical specimen of dry sand was tested in triaxial test. Failure occurred under a cell pressure of 1.2kg/cm^2 and at a deviator stress of 4kg/cm^2 . Estimate
- i) Angle of shearing resistance of soil.
 - ii) Normal and shear stresses on the failure plane
 - iii) The angle made by the plane with the minor principal plane.
 - iv) The maximum shear stress on any plane in the specimen at an instant of failure.

Or

- (b) An unconfined compression test was conducted on an undisturbed sample of Clay. The sample had a diameter of 38 mm and length 76mm. The load at failure was 50 N and the axial deformation of the sample 15mm. Estimate the undrained shear strength parameters, if the failure plane made an angle of 60° with horizontal.

15. (a) A slope is to be constructed in a soil for which $C=0$ and $\Phi = 30^\circ$, It is to be assumed that the water level may occasionally reach the surface of slope, which seepage taking place parallel to the slope. Determine the maximum slope angle for a factor of safety of 1.5, assuming a potential failure parallel to the slope, what would be the factor of safety of the slope, constructed at this angle, if the water table should be well below the surface? The saturated unit weight of the soil is 22kN/m^3 .

Or

- (b) A slope of very large extent of soil with properties $C' = 0$ and $\phi' = 38^\circ$ is likely to be subjected to seepage parallel to the slope with water level at the surface. Determine the maximum angle of slope for a factor of safety of 1.5 treating it as an infinite slope. For this angle of slope what will be the factor of safety if the water level were to come down well below the surface? The saturated unit weight of soil is 25 kN/m^2 .

