Question Paper Code	12373

B.E. / B.Tech. -DEGREE EXAMINATIONS, NOV / DEC 2023
Fourth Semester
Civil Engineering
20CEPC403 - SOIL MECHANICS
(Taylors Stability Chart is Permitted)
(Regulations2020)

Duration: 3 Hours   Max. Marks: 100

PART-A (10 × 2 = 20 Marks)
Answer ALL Questions

Marks,
K-Level, CO

1. What do you understand by residual soil and transported soil?   *2,K2,CO1*
2. Define relative compaction.   *2,K1,CO1*
3. What is capillary rise in soil ?   *2,K2,CO2*
4. List out the application of Flow nets.   *2,K1,CO2*
5. Write the uses of Newmarks influence charts.   *2,K1,CO3*
6. Define consolidation.   *2,K1,CO3*
7. Write down the Mohr-coulomb failure envelop equation.   *2,K1,CO4*
8. What is Mohr's circle?   *2,K1,CO4*
9. Find the factor of safety of an infinite slope of cohesion less soil of angle of friction 36° ,if the slope angle is 30°.   *2,K2,CO6*
10. Write some slope protection measures in soil.   *2,K2,CO6*

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) (i) The weight of wet soil is compacted in a mould was 18 kN. The water content of the soil was 17%. If the volume of the mould is 0.95 m^3, determine the dry unit weight, void ratio, degree of saturation and percent of air voids. Take G =2.65   *8,K3,CO1*

   (ii) Derive the relationship between dry and bulk density in terms of water content   *5,K3,CO1*

OR

   b) (i) Give step-by-step procedure for the classification of soil by Indian Standard Classification system.   *10,K3,CO1*

   (ii) Find the liquid limit if plasticity index is 20% and plastic limit is 17%. Also give your comment on type of soil where natural water content is 30% .   *3,K3,CO1*

K1 – Remember; K2 – Understand; K3 – Apply; K4 – Analyze; K5 – Evaluate; K6 – Create   **12373**

12. a) The water table in a deposit of sand 8m thick is at a depth of 3 m below the ground surface. Above the water table the sand is saturated with capillary rise. The bulk density of the sand is 19.62 kN/m³. Calculate the effective stress at 1m, 3m and 8m below the ground surface. Hence plot the variation of total stress, pore water pressure and effective stress over the depth of 8 m. *13,K3,CO2*

OR

b) Establish the Laplace equation for two dimensional flow in the construction of flow net. *13,K2,CO2*

13. a) A concentrated load of 1000kN is uniformly distributed load acts vertically at the ground surface. Determine the vertical stress at a point which is at *13,K3,CO3*
   (i) a depth of 2.5m and a horizontal distance of 4.0m
   (ii) a depth of 5.0m and at radial distance of 2.5m

OR

b) Subsurface explorations at the site of a proposed building reveals the existence of 2.4m thick layer of soft clay below a stratum of coarse sand which extends from the ground surface upto the top of the clay layer. The ground water table is at 2.5m below the ground surface. Laboratory tests indicate the natural water content of the clay is 40%, average liquid limit as 45% and specific gravity of solids as 2.75. The unit weight of sand above and below water table is 17.8kN/m³ and 21kN/m³ respectively. Estimate the probable settlement of the building, if its construction increases average vertical pressure on the clay layer by 71kPa. *13,K3,CO3*

14. a) The results of consolidated undrained test on a compact soil are given below: *13,K3,CO4*

Sample No.	σ_3 (kN/m²)	$(\sigma_1-\sigma_3)$ kN/m²	u (kN/m²)
1	70	230	- 20
2	350	550	+90

OR

b) Explain Mohr's coulomb failure theory. Derive the relation between principal stresses at failure and shear strength parameters. *13,K2,CO4*

15. a) A soil mass underlying by rock mass was an infinite slope of shear strength parameters C =18kN/m² and Φ =25°. *13,K3,CO6*
   (i)If H=8m and β =20°.Find the factor of safety against sliding on rock surface.
   (ii)If β =30° Find the height H for which factor of safety is 1, Assume the pore water pressure is zero.

OR

b) Discuss the friction circle method for the stability analysis of slopes.   *13,K3,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Explain the shear test procedure to determine the shear parameters in a very soft clay stratum. State its advantages and limitations.   *13, K3,CO5*

<div align="center">OR</div>

b) In a triaxial test on a partially saturated soil the specimen was initially consolidated under a pressure of 500kPa. Closing the drainage valve the cell pressure was risen to 750kPa, when a pore pressure of 200kPa was observed. Thedeviator stress at failure was 1500kPa. Compute the skemptons pore pressure parameters if pore pressure at failure is 400kPa.   *15,K3,CO5*