

Registration No.:

--	--	--	--	--	--	--	--	--	--

Total Number of Pages: 02

Course: IDD (B.Tech and M.Tech)
Sub_Code: RCI5C003

5th Semester Regular/Back Examination: 2024-25

SUBJECT: Geotechnical Engineering

BRANCH(S): C&EE, CIVIL, CE,

Time: 3 Hours

Max Marks: 100

Q.Code: R070

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Distinguish between Residual and Transported soil.
- Differentiate between Compaction and Consolidation.
- Establish the relationship between void ratio and porosity of soil mass.
- What are the assumptions made by Boussinesq's in deriving the expression for stress in soil due to a point load on the ground surface?
- State the different modes of soil water.
- Define Consistency Limits. Why they are required to find in geotechnical Engineering?
- Draw the Mohr's circle for unconsolidated undrained test and explain about failure envelop.
- Write the equation of the A-line, and explain the terms in it.
- Draw a typical grain size distribution curves for different types of soils.
- What is the use of New mark's influence chart?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- The mass of wet soil when compacted in a mould was 19.6 kN. The water content of the soil was 15%. If the volume of the mould was 0.96 m³, Determine (i) dry unit weight, (ii) Void ratio, (iii) degree of saturation and (iv) percent air voids. Take $G = 2.7$.
- Differentiate between Standard Proctor Test and Modified Proctor Test.
- For a gravel with $D_{60} = 4.8$ mm, $D_{30} = 1.25$ mm and $D_{10} = 0.35$ mm, calculate the uniformity coefficient and coefficient of curvature. Is it a well graded or a poorly graded soil?
- The laboratory tests on a sample of soil gave the following results:
 $w_n = 24$ %, $w_L = 62$ %, $w_p = 28$ %, percentage of particles less than 2 microns = 23%.
Determine: (i) The liquidity index, (ii) activity, (iii) consistency and nature of soil.

- e) Differentiate between shear strength parameters obtained from total and effective stress considerations.
- f) What is relation between OMC and MOD? Draw the graph for zero air voids.
- g) Define Quick sand condition and derive the expression for critical hydraulic gradient.
- h) Discuss the drainage conditions generally used in tri-axial compression test.
- i) State and explain Darcy's law.
- j) What do you understand by 'Pressure bulb'? Illustrate with sketches.
- k) Discuss Terzaghi's theory of consolidation by stating the various assumptions and its validity.
- l) State under consolidated, normally consolidated, and over consolidated soil with example.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

- Q3** a) Describe the formation of soil due to mechanical weathering. (8)
- b) A soil stratum consists of 3 layers of thickness 1 m, 1.5 m and 2.0 m having the coefficient of permeability of 2×10^{-3} cm/s, 1.5×10^{-3} cm/s and 3×10^{-3} cm/s respectively. Estimate the average co-efficient of permeability in the direction i) parallel to the bedding plane ii) normal to the bedding plane. (8)
- Q4** a) Explain the properties of flow net. (6)
- b) An 8 m thick layer of saturated clay is overlain by 4.0 m deep sand. The water table is 2.0 m below the ground surface. The saturated clay and sand are 21 kN/m^3 and 19 kN/m^3 respectively. The unit weight of sand above the water table is 16 kN/m^3 . Find out the total and effective vertical pressure at the water table, at top, middle, and bottom of clay layer. (10)
- Q5** a) What are the factors that affect compaction? (8)
- b) A monument 5000 kN is erected on the ground surface. Considering the load as concentrated, determine the vertical pressure directly under the monument at a depth of 10 m below the ground surface. Also calculate the vertical pressure at a point, which is at a deputation of 10 m and a horizontal distance of 5 m from the axis of the load. (8)
- Q6** a) Describe the direct shear test. What are its merits and demerits compared to Triaxial test? (6)
- b) Two identical specimens of soil were tested in a tri-axial apparatus. The first specimen failed at a deviator stress of 800 kN/m^2 when the cell pressure was 200 kN/m^2 while the second specimen failed at a deviator stress of 1400 kN/m^2 when the sell pressure was 300 kN/m^2 . Determine c and ϕ for the soil. (10)