

- (c) According to Indian standards. in a 2mm sieve
- (i) there are 2 holes
 - (ii) each sieve is circular and its diameter is 2mm
 - (iii) each hole is a square and its side is 2mm
 - (iv) there are 2 holes per cm length of the mesh
- (d) uniformity co-efficient of soil is defined as the ratio of
- (i) D_{40} to D_{10}
 - (ii) D_{40} to D_{20}
 - (iii) D_{50} to D_{10}
 - (iv) D_{60} to D_{10}
- (e) The activity of a clay is defined as the ratio of
- (i) liquid limit to plastic limit
 - (ii) liquidity index to plasticity index
 - (iii) plasticity index to clay fraction
 - (iv) plasticity index to shrinkage index
- (f) The equipotential line in a seepage through a soil medium is defined as the
- (i) path of particle of water through a saturated soil mass
 - (ii) line connecting points of equal head of water
 - (iii) flow of movement of fine particles of soil
 - (iv) direction of the flow particle

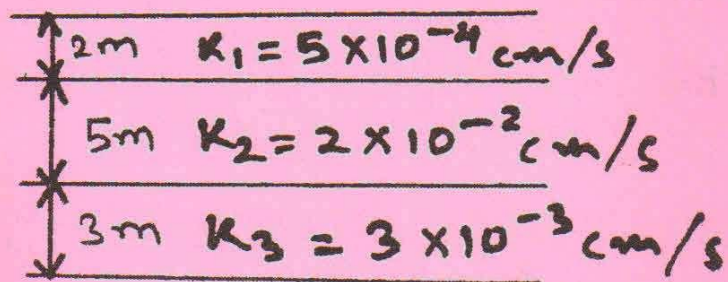
- (g) Flow lines and equipotential lines are
- (i) perpendicular to each other
 - (ii) parallel to each other
 - (iii) intersecting lines at 90° to each other
 - (iv) intersecting lines at 45° to each other
- (h) The effective stress on the soil due to
- (i) external load acting on the soil
 - (ii) weight of the soil particles
 - (iii) weight of water present in soil pores
 - (iv) both (a) & (b)
- (i) The compression index of the soil
- (i) increases with the increase in liquid limit
 - (ii) decreases with the increase in liquid limit
 - (iii) increases with the decrease in plastic limit
 - (iv) decrease with the increase in plastic limit
- (j) The shear strength of a soil
- (i) is proportional to the cohesion of the soil
 - (ii) is proportional to the tangent of the angle of internal friction
 - (iii) increases with the increase in normal stress of soil
 - (iv) all of the above

2. (a) Express bulk unit weight in terms of specific gravity, void ratio, water content and unit weight of water. (5)
- (b) Briefly explain the different soil aggregate properties. (5)
- (c) Wet soil weight of 1 cubic metre is 20kN . If its dry unit weight is 18 kN, determine the water content, porosity, void ratio and degree of saturation. Specific gravity of solids is 2.67. (5)
3. (a) Briefly explain consistency limits with a suitable plot of water content and volume of soil mass. (5)
- (b) Discuss the origin of soil formation. (4)
- (c) Under what condition, sand replacement method is preferred over core cutter method to determine unit weight of soil. (2)
- (d) A soil sample has a porosity of 40%. The specific gravity of solids is 2.70. Calculate (i) void ratio (ii) dry density (iii) unit weight if the soil is 50% saturated (iv) unit weight if the soil is completely saturated. (4)
4. (a) List out the differences between compaction and consolidation. (5)
- (b) The following data refers to a compaction test as per Indian standard (light compaction) (10)

Water content (%)	9	12.1	13.4	15.1	18.2	20.4
Weight of wet sample (kg)	1.80	1.94	2.00	2.05	2.03	1.98

If the specific gravity of soil grains was 2.7 ,
 (i) Plot the compaction curve and obtain the maximum dry unit weight and the optimum moisture content and (ii) Plot the 80% saturation line

5. (a) Explain diagrammatically the forms of ground water. (4)
- (b) Bring out the principle of effective stress as enunciated by Terzaghi. (5)
- (c) What do you mean by permeability of soil? State and explain Darcy's law. (2+4)
6. (a) A stratified soil deposit is shown with the co-efficients of permeability of the individual strata. Determine the ratio of K_H and K_V assuming the average hydraulic gradient of 0.3 in both horizontal and vertical seepage. Find the discharge value for both horizontal and vertical flow. (8)



- (b) Explain flow net with the help of a diagram. (7)
7. (a) Briefly state Terzaghi's theory of one dimensional consolidations. (2)
- (b) Explain in the mechanism of consolidation with the help of spring analogy. (5)

- (c) Calculate the co-efficient of volume change for pressure range 100 to 200 kN/m² by (i) change in thickness method and (ii) change in void ratio method, with the help of given data: initial void ratio=1.121, final void ratio=0.964, initial height 2.080 cm and height after settlement = 1.926 cm. (6)
- (d) What is secondary consolidation? (2)
8. (a) Explain briefly Mohr-Coulomb failure criteria equation. (5)
- (b) Determine the shear strength in terms of effective stress on a plane with a saturated soil mass at a point where the normal stress is 200 kN/m² and the pore water pressure is 80 kN/m². The effective shear strength parameters for the soil are $c' = 16 \text{ kN/m}^2$ and $\phi' = 30^\circ$. (5)
- (c) Bring out the detailed procedure of the direct shear test. (5)
9. (a) What are the basic modes of failure in a slope? (5)
- (b) Explain the Swedish Circle method of slope stability analysis. (10)