

Soil Mechanics and Foundations Engineering
(CE-206) MM-15

Attempt any three questions

- Q1 Define Atterberg limits.
- Q2 Explain Particle size classification of soil
- Q3 Define Darcy's law and its validity
- Q4 Explain any one lab method to determine permeability
- Q5 What is compaction? What are factors affecting compaction.

Soil Mechanics and Foundation Engineering

Ans 1 Atterberg defined three consistency limits for soil

- (i) Liquid limit (w_L) - It is the ^{minimum} water content at which soil behaves like liquid.
- (ii) Plastic limit (w_p): The minimum water content at which a soil passes from liquid state to plastic state.
- (iii) Shrinkage limit: - It is the water content at which soil passes from semi solid to solid state.

Ans 2 Darcy's law says that for laminar flow through saturated soil the rate of flow 'q' across a sectional area 'A' of soil is proportional to the hydraulic gradient

$$q = k i A$$

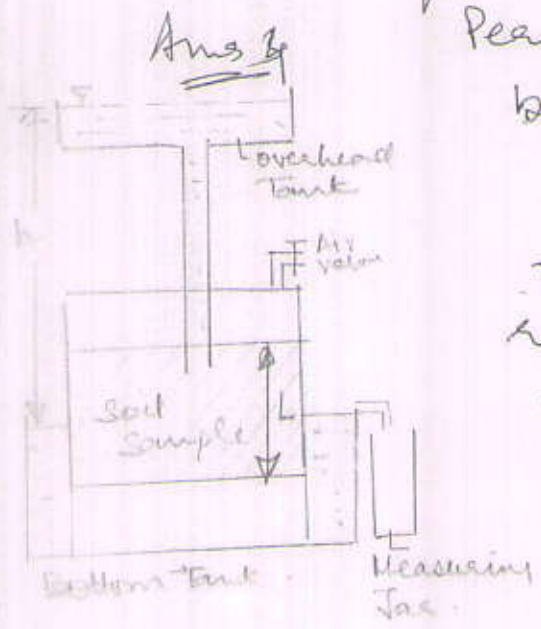
k = coefficient of permeability -

It is valid only for laminar flow or for Reynolds no. less than 2000.

Permeability can be determined by two lab tests

- (i) Falling head Permeability Test
- (ii) Constant head Permeability Test

The diagram shows diagrammatic representation of constant head permeability test. Water flows from the overhead tank and constant head 'h' is maintained throughout the test. Length of the soil sample 'L' is fixed throughout the test.



We know the hydraulic gradient i

$$i = \frac{h}{L}, \quad \text{where } h = \text{difference of water level of overhead tank \& bottom tank}$$

If Q is the total quantity of flow in a time interval 't', We have from Darcy's law

$$q = \frac{Q}{A} = kiA$$

$$k = \frac{Q}{tiA} = \frac{Q}{t} \times \frac{L}{h} \times \frac{1}{A} = \frac{QL}{thA}$$

where A = cross-sectional area of the sample.
This test is suitable for coarse grained soil where a reasonable discharge can be collected in a given time.

Ans

Compaction is the process by which soil particles are packed more closely together by dynamic loading such as rolling, tamping or vibration by reduction of air voids in the soil.

Factors effecting compaction

- Moisture content
- Compactive effort
- Type of soil
- Method of compaction
- Addition of admixtures.

Answer
19/1/12