Geotechnical Engg.-I (VI Sem)

Unit-2

(Part-1 Soil water)

Soil water:

Water is present in the voids of the soil mass is called soil water.

It can classified in various several ways:

1. Broad classification
    1. Free water or gravitational water
    2. Held water
        (i) Structural water
        (ii) Adsorbed water
        (iii) Capillary water

2. Classification based on phenomenological basis
    1. Ground water
    2. Capillary water
    3. Adsorbed water
    4. Infiltered water
3. Classification on structural aspect
    1. Pore water
    2. Solvate water
    3. Adsorbed water
    4. Structural water

Ground water:

It is subsurface water that fills the voids continuously and is subjected to no forces other than gravity this water is also known as ***gravitational water or free water***. Such a water has a free surface which can be easily observed in wells and bore holes. Groundwater obeys laws of hydraulics and is capable of moving under hydrodynamic forces.

Capillary water:

It is the water which is lifted up by surface tension above the surface of free ground water surface. The capillary water fills all the pores in the soil, to a certain distance above the water table this distance being known as the zone of capillary saturation.

Adsorbed water:

It consists of (i) hygroscopic water (ii) film water.

Hygroscopic water or Contact moisture or Surface bound water is that water which the soil particles freely absorb from atmosphere by the physical forces of attraction and is held by the forces of adhesion. This form of moisture is in a dense state and surrounds the surfaces of individual soil grains as a very thin film. It has greater density, greater viscosity, higher boiling point and lower freezing point as compared to ordinary water.

Coarse grained soils have relatively low hygroscopic moisture because of their low specific surface.

The average ***hydroscopicity*** of sands, silts and clays is 1%, 6% and 16% respectively.

Film moisture is attached to the surface of soil particles as a film on the layer of hygroscopic film. This film is forms because of condensation of aqueous vapour. It is held by molecular forces of high intensity but not as high as in the case of hygroscopic film. Film water can migrate on the application of external energy potential (i.e. thermal potential or electric potential).

Infiltered water:

It is that portion of surface precipitation which soaks into the ground moving downwards through air-containing zones.

Pore water:

The capillary water and the gravitational water may be considered as the two types of pore water. It exhibits the physical and chemical properties of ordinary liquid water. It is capable of moving under hydrodynamic forces unless restricted in its free movement, such as when and trapped between air bubbles or by retension due to capillary forces that in fine pores may overcome hydrodynamic forces.

Solvate water:

It is that water which forms a hydration shell (not more than 200 molecules thick) around soil grains. It is subjected to polar, electrostatic and ionic binding forces. It remains mobile under hydrodynamic forces, though its density and viscosity are greater than those of ordinary water.

Structural water:

It is the water chemically combined in the crystal structure of the soil mineral. It refers to hydroxyl groups that constitutes parts of crystal lattice. Under loading encountered in soil engineering, the structural water cannot be separated or removed and is therefore unimportant. It can also not be removed by oven drying at 105-110

degree celsius. It can only be driven off at such high temperature as would cause the destruction of the crystal structure. It is therefore considered the part of the soil particles.

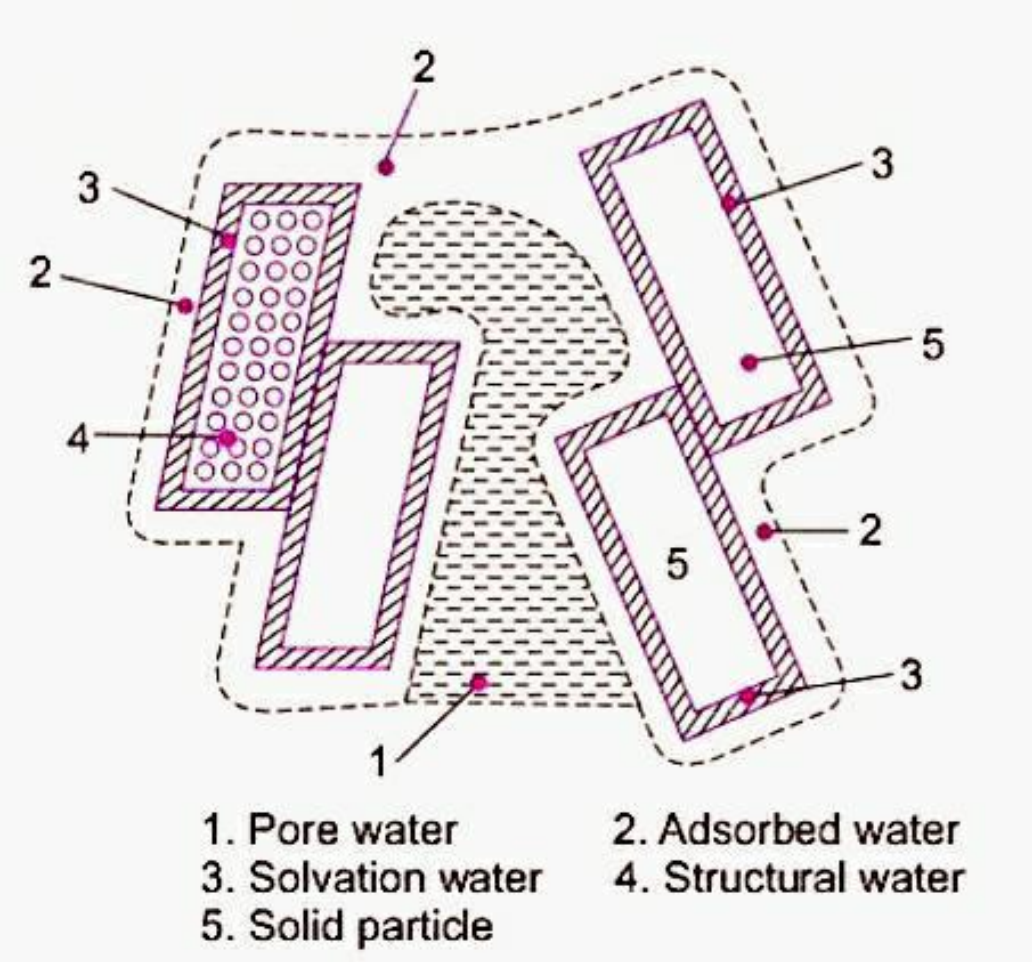

Fig 1. Classification of water in soil