

THEORY & OBJECTIVE

SOIL MECHANICS

*By
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BASIC TYPES OF SOIL

THEORY

1.1 SOIL TYPES AND FORMATIONS

- There are two main groups of soils according to their origin (i) soils formed by physical weathering e.g., Gravel and Sand (ii) Soils formed by chemical weathering e.g., silts and clays.
- If the products of rock weathering are still located at the place of origin, they are called Residual soils.
- Any soil that has been transported from its place of origin by wind, water, ice or any other agency and has been re-deposited is called Transported soil.
- **Alluvial Soils** : deposited from suspension in Running Water.
- **Lacustrine Soils** : deposited from suspension in still, fresh water of lakes.
- **Marine Soils** : deposited from suspension in sea water.
- **Aeolian Soils** : Transported by wind.
- **Glacial Soils** : Transported by Ice.

1.2 SOME SPECIAL/TYPICAL SOILS

- **Loess** : A loose deposit of windblown silt that has been weakly cemented with calcium carbonate and montmorillonite.
- **Bentonite** : A chemically weathered volcanic ash.
- **Peat**: A highly organic soil; fibrous and highly compressible.
- **Muck** : A mixture of fine particles, inorganic soil and black, decomposed organic matter.

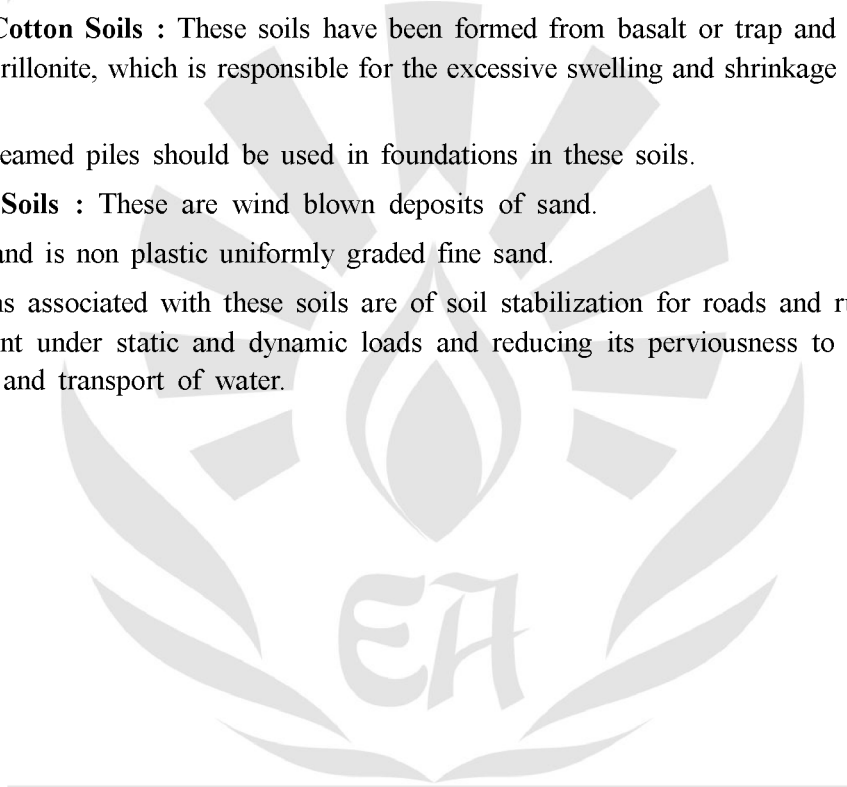
Note : Peat and Muck are also called cumulose soils.

- **Colluvial Soil** : the accumulation of rock debris or **Talus** at the base of a steep cliff or a rock escarpment due to action of gravity.
- **Marl** : A very fine grained calcium carbonated soil of marine origin.

1.3 SOME COMMON SOILS AND ENGINEERING PROBLEMS**ENCOUNTERED WITH THEM**

- **Marine Deposits** : Marine clays are very soft and may contain organic matter.
- These Possess low shear strength and high compressibility hence, pose problems as foundation material.
- **Laterites And Lateritic Soils** : Formed by decomposition of rock. removal of the bases and silica and formation of oxides of iron and aluminium at the top of the soil profile.
- These are two types – Primary and Secondary. Primary laterite is found at high altitude near hills.
- Secondary laterites are found at coastal belts.
- Generally laterites pose no difficulties as foundation material and retain their slopes well.
- **Black Cotton Soils** : These soils have been formed from basalt or trap and contain clay mineral montmorillonite, which is responsible for the excessive swelling and shrinkage characteristics of the soil.
- Under reamed piles should be used in foundations in these soils.
- **Desert Soils** : These are wind blown deposits of sand.
- Dune sand is non plastic uniformly graded fine sand.
- Problems associated with these soils are of soil stabilization for roads and runways for reducing settlement under static and dynamic loads and reducing its perviousness to make it suitable for storage and transport of water.

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OBJECTIVE SHEET

1. Match List-I (Type of soil) with List-II (Mode of transportation and deposition) and select the correct answer using the codes given below lists:

List-I

A. Lacustrine soils

B. Alluvial soil

C. Aeolian soils

D. Marine soils

List-II

1. Transportation by wind

2. Transportation by running water

3. Deposited at the bottom of lakes

4. Deposited in sea water

Codes: **A** **B** **C** **D**

(a) 1 2 3 4

(b) 3 2 1 4

(c) 3 2 4 1

(d) 1 3 2 4

2. Lacustrine soils are soils

(a) transported by rivers and streams

(b) transported by glaciers

(c) deposited in sea beds

(d) deposited in lake beds.

3. Consider the following statements in the context of aeolian soils:

1. The soil has low density and low compressibility.

2. The soil is deposited by wind.

3. The soil has large permeability.

Which of these statements are correct?

(a) 1, 2 and 3

(b) 2 and 3

(c) 1 and 3

(d) 1 and 2

4. Match List-I with List-II and select the correct answer using the codes given below the lists:

List-I

A. Loess

B. Peat

C. Alluvial soil

D. Marl

List-II

1. Deposited from suspension in running water

2. Deposits of marine origin

3. Deposits by wind

4. Organic soil

Codes: **A** **B** **C** **D**

(a) 3 4 2 1

(b) 4 3 1 2

(c) 4 3 2 1

(d) 3 4 1 2

□□□

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ANSWERS AND EXPLANATIONS

1. *Ans. (b)*

All types of soils carried and deposited by water are known as alluvial deposits. Deposits made in lakes are called lacustrine deposits. Marine deposits are formed when the flowing water carries soils to ocean or sea. Soils deposited by wind are known as Aeolian deposits.

2. *Ans. (d)*

Lacustrine soils are silt and clays which have been deposited in still, fresh water of lakes.

3. *Ans. (b)*

Aeolian soils are deposited by winds. It consist of uniformly graded particles. The void ratio and permeability of soil are high. They are non-plastic and can withstand deep vertical cuts due to slight cementation between particles. These soils have high compressibility and density is low in natural states. Example: Fine sand in dunes; loess.

4. *Ans. (d)*

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