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Q1:- Write a detail note on M/T and AASHTO Soil Classification System?

Ans:-

(1) M.I.T Soil Classification System:-

In This ~~Classification~~ System Soil are classified on the basis of grain, Sizes, names gravel, Sand, Silt and Clay are used to indicate various grain Sizes.

Soil with grain Sizes from 100mm-2mm are termed as gravels, Soil with grain Sizes from 2mm - 0.06mm are termed as Sand, Soil with grain Size from 0.06 To 0.02mm are Termed as Silt and Soil with grain Sizes less than 0.02mm are Termed as Clay-

=> Sand & Silt are further Subscribe divided into Coors, Medium & Silt-

The detailed are Shown in Table.

Gravil	Sand			Silt Size			Clay Size
2mm				0.06			0.02
	Course	Medium	Fine	Coarse	Medium	Fine	
2	0.6	0.2	0.06	0.02	0.06	0.00d2	

This System is also called is particle Sizes classification System because the names are given to the particles on basis of their sizes. This System does not signify the naturally occur Soil - which are mixture of particle of different Sizes.

=> Group Index :-

It is a parameter used to evaluate the quality of a soil as a highway Sub grade materials.

It is given by the following equation-

$$G.I = (F_{200} - 35)\,[0.2 + 0.005\,(L_L - 40)] + 0.01\,(F_{200} - 15)\,(PI - 10)$$

F_{200} = % passing (% finer) through No 200 sieve.

L_L = Liquid Limit.

PI = Plasticity Index.

The Term $(F_{200} - 35)$ Should be +ve otherwise zero.

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In some books it is written as

$GI = 0.2a + 0.005ac + 0.01bd$

$a = F_{200} - 35$

$b = F_{200} - 15$

$C = LL - 40$

$d = PI - 10$

The group index always represent +ve whole number.

The higher the value of GI for soil, the weaker will be the soil performance as a sub-grade material.

Example:-

The result of sieve analysis for soil sample brought from field are as follow.

1/0 passing through No 1 sieve = 100

" " " " 40 " = 80

" " " " 20 " = 58

The liquid limit & plasticity index for a soil is also determined 30 and 10 respectively.

Find grouped index for soil.

$G.I \approx 3.45 \approx 3$

GI will be positive whole No & never negative.

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(2) AASHTO Soil Classification System:-

This System is also called highway research board (HRB) Classification of material for highway Subgrade. Its main Characteristic are as follows-

(i) According To This System Soil are divided into eight groups as A-1, A2, A3, A4, A-5 A-6, A-7, A-8-

(ii) The group A-1 is Subdivided into Two groups as A-1-a, A-1-b. This Subdivision is based on The basis of percent passing Through Sieve #10, Sieve #12 & Sieve #200-

(iii) The group A-2 is also Subdivided into four Subgroups - A-2-4, A-2-5, A-2-6, A-2-7- The Sub division is also based on The percent passing Through Sieve No 10, 40, 200- The group A-7 is Sub divided into A-7-5 A-7-6 - This Subdivision is based on Qiquid Qimit & plasticity Index-

(iv) The group A-3 is placed in b/w A-1 and A-2 because its properties are in between A1 and A2 -

The Soil belonging To A_1, A_2, A_3 is called granular material - Such material have ~~present~~ percent passing through No 200 Sieve less than or equal To 35-

The Soil belonging To A-4, A-5, A-6 A-7 is Termed as Silty - Clay (Fine Material) Such Soil have percent passing Through Sieve NO 200 greater than 35 OR ($F_{200} > 35$) -

The group A-8 is not shown in the classification chart- It is highly organic weak Soil-

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Q2:- Define permiability? write note on factors affecting permiabilty?

Answer:- permiability:-

permiability of Soil is the property of Soil due to which it permits the passage of water through its interconected voids. The Soil which has more & larger interConnected voids will be highly permiable Such as gravel - while the Soil having less & Smaller non Connected voids will be least permeable - Such as clay-

=> Factors affecting permiability:-

Following factors affecting permiability.

(1) Size of Soil particle:-

permeabiliy varies according to Size of Soil particle - If the Soil is Coarse grained, permiability is more & if it is fine grained, permiability is low-

(2) Specific Surface Area of particles:-

Specific Surface area of Soil particles also effects the permeability Higher the Specific Surface area lower will be the permeability-

(3) Shape of Soil particle:-

Rounded particles will have more permeability than angular Shaped- it is due to specific area of angular particles is more compared to rounded particles-

(4) Void Ratio:-

In general, permeability increases with void ratio. But it is not applicable to all types of Soils- e.g:- Clay has high void ratio than any other types of Soil but permeability for clays is very low. This is due to the flow path through voids in case of clays is extremely small such that water cannot permit through this path easily-

(5) Degree of Saturation:-

Partially Saturated Soil Contain air voids which are formed due to entrapped air or gas released from the percolating fluid or water. This air will block the flow path there by reduces the permeability - Fully Saturated Soil is more permiable then partially Saturated Soil

(6) Adsorbed water:-

Adsorbed water is the water layer formed orround the Soil particle especially in the case of fine-grained Soils - This reduced the size of the void space by about 10%. Hence permiability reduces-

(7) organic matter:-

presence of organic matter decreases the permiability - This is due to blockage of voids by the organic matter.

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Q3:-

(a) Define Compaction? its advantages & write a detail note on moisture density relationship

Answer:- Compaction:- In geotechnical engineering Soil Compaction is the process in which stress is applied to a Soil causes densification as air is displaced from the pores between soil grains-

=> Advantages:-

* Economies of Scale - Lower average costs from increased Scale-

* High profit can be used for research & development - Dynamic efficiency-

* The reward of getting patent (a monopoly power) can encourage investment.

* Firms who become monopolies may just be very efficient, Succesful & innovative-

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=> Moisture Density relationship :-

Moisture Content of Soil is defined as the ratio of mass of water to the mass of solids present in the Soil Sample.

To obtain relationship between the moisture Content & dry density, multiply the numerator & denominator of expression of dry density with "M" which is mass of Soil Sample.