

**Soil Mechanics – Tutorial 3**  
**Theory**

1. What are the different soil classification systems? Explain the textural type of soil classification.
2. What are the purposes and requirements of soil classification? How do you classify the soil according to USCS?
3. Compare the AASHTO classification system and Unified Soil Classification System.
4. Differentiate ISCS and USCS method of soil classification.
5. List out the methods for field identification of silt and clay. Describe dispersion test.

**Numerical**

1. Classify the soils A and B with the properties as shown below, according to USC System.

Soil	LL (%)	I <sub>p</sub> (%)	% Passing No. 4 Sieve	% Passing No. 200 Sieve
A	45	29	100	59
B	55	15	100	85

2. The sieve analysis of a given sample of soil gave information that 65% of the particle pass through 75-micron sieve. The following data has been obtained from liquid and plastic limit tests on the soil in the laboratory.

Details	Liquid Limit Test Data				Plastic Limit	
Mass of container with wet soil, (g)	43.35	47.5	45	44.95	43.62	40.38
Mass of container with dry soil, (g)	40.18	43.61	41.87	41.5	41.94	38.85
Mass of container only, (g)	29.86	31.5	32.05	30.51	33.1	30.9
Number of blows (N)	34	27	23	17		

Determine:

- i) Liquid limit, Plastic limit and flow index.
  - ii) Classify the soil as per the Unified Soil Classification System.
  - iii) Liquidity index if the natural water content of the soil is 30%.
3. Two soils were tested for their consistency in the lab. The following data were obtained.

Soil A		Soil B	
No of blows (N)	Water Content (%)	No of blows (N)	Water content (%)
8	43	5	65
20	39	15	61
30	37	30	59
45	25	40	58
Water content at which soil crumbled of 3mm diameter.	25%	Water content at which soil crumbled of 3mm diameter.	30%
Natural Water Content	40%	Natural Water Content	50%

Determine:

- i) Which soil has greater plasticity?
- ii) Which soil is more compressible in nature?
- iii) Classify the both soils as per IS Classification System.

4. A sample of soil was tested in a laboratory, and the following observations were recorded.

Liquid Limit = 45 %

Plastic Limit = 16 %

U.S. Sieve No.	No. 4	No. 10 (2.0 mm)	No. 40 (0.425 mm)	No. 200 (0.075 mm)
Percentage Passing	100	91.5	80	60

Classify the soil according to AASHTO System.

5. Mechanical analysis on four different sample designated as A, B, C and D were carried out in a soil laboratory. The results of tests are given below. Hydrometer analysis was carried out on sample D. Soil is non-plastic.

Sample D: Liquid Limit = 42, Plastic Limit = 24, Plasticity Index = 18

Classify the soil as per the Unified Classification System.

Samples ASTM Sieve Designation	A (% finer than)	B (% finer than)	C	D
63 mm	100		93	
20 mm	64		76	
6.3 mm	39	100	65	
2.0 mm	24	98	59	
600 μ	12	90	54	
212 μ	5	9	47	100
63 μ	1	2	34	95
20 μ			23	69
6 μ			4	46
2 μ			7	31

6. The percentage of sand, silt and clay are 12%, 24% and 44% respectively. Classify the soil as per textural system of soil classification.

- **Deadline – 24<sup>th</sup> Magh, 2076**