

## Problems of Seive Analysis or partial size distribution

**Problem 1)** The following gives the results of sieve analysis for two soil sample A and B . determine the effective size , coefficient of uniformity and classify the soil by unified method ?

Sieve ( mm)	% Finer	
	Soil A	Soil B
63	100	-
20	64	100
6.3	39	94
2	24	69
0.6	12	32
0.212	0.5	13
0.063	1	2

Answer :

**Important Note :** For uniformly graded soil : Coefficient of uniformity =  $C_u = 1$  or nearly 2

For well graded soil :

Coefficient of uniformity =  $C_u = 2$  to 15 and Coefficient of curvature =  $C_c = 1$  to 3

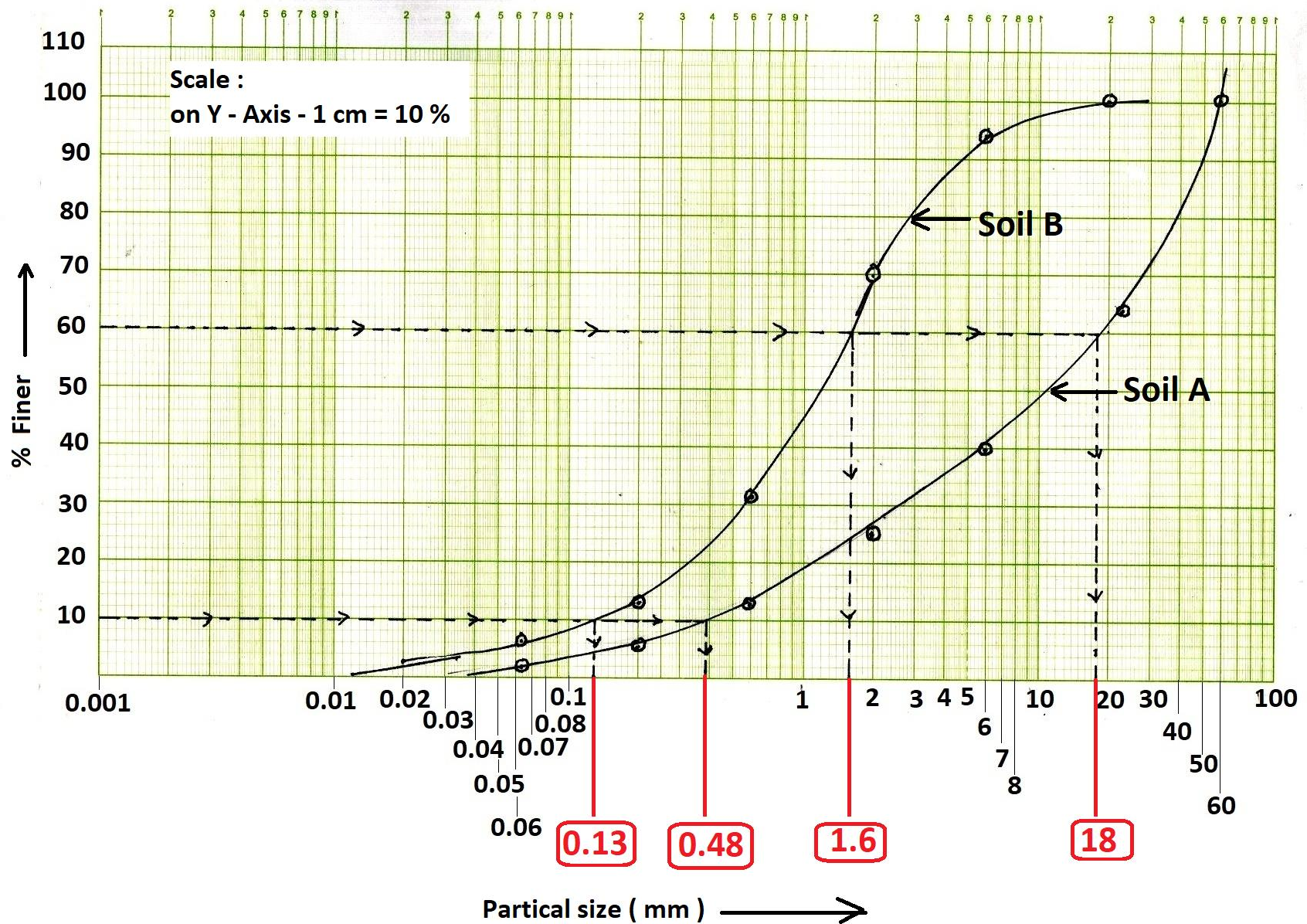
Draw semi log graph as sieve size on X axis and % finer on Y axis.

**for soil A :**  $D_{10} = 0.48$  mm and  $D_{60} = 18$  mm

Coefficient of uniformity =  $C_u = \frac{D_{60}}{D_{10}} = \frac{18}{0.48} = 37.5$  hence the soil is poorly graded.

**for soil B :**  $D_{10} = 0.13$  mm and  $D_{60} = 1.6$  mm

Coefficient of uniformity =  $C_u = \frac{D_{60}}{D_{10}} = \frac{1.6}{0.13} = 12.30$  hence, the soil is well graded.



Problem 2) the result of sieve analysis on dry soil sample weighing 1000 gm are given below.

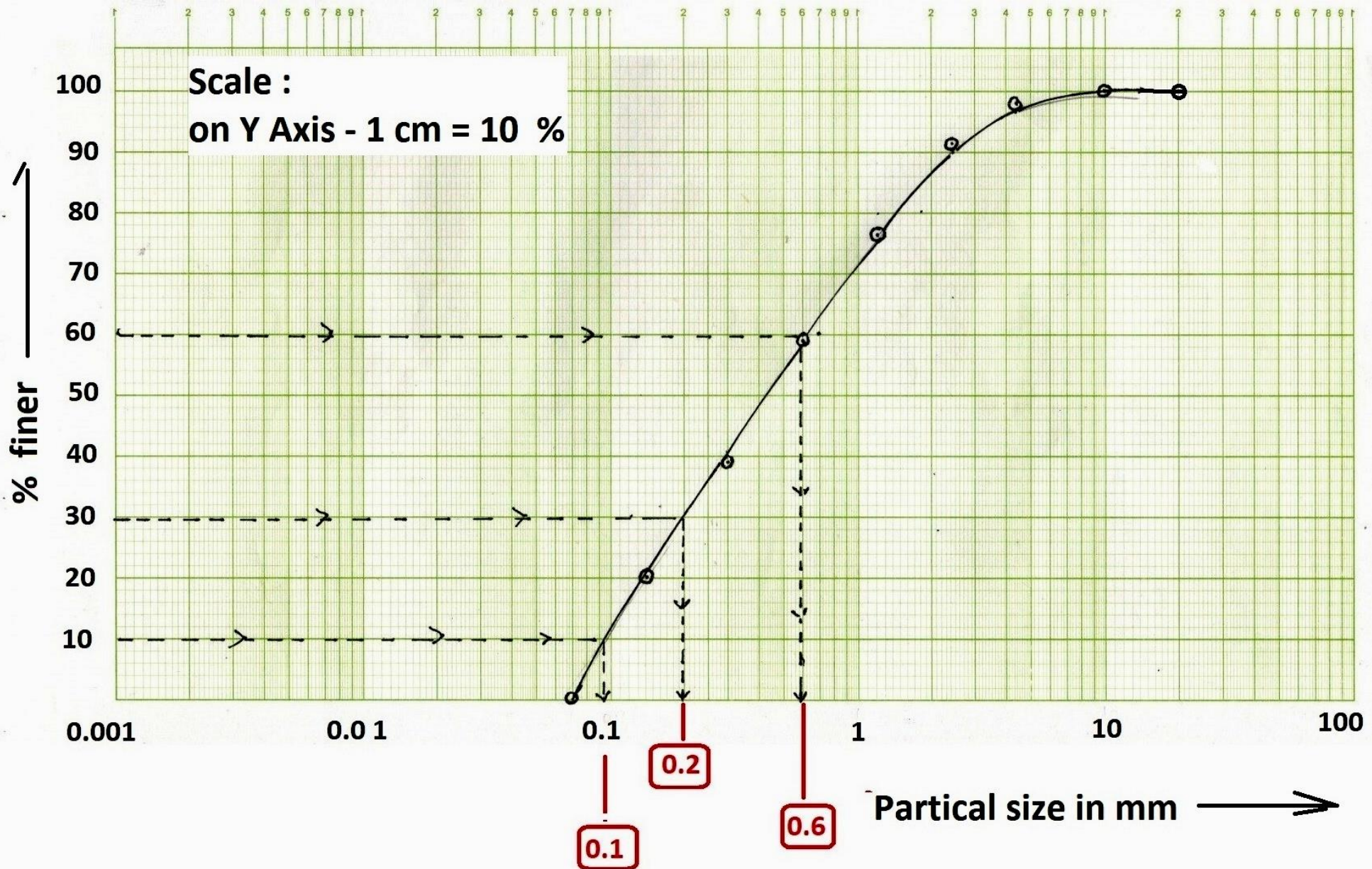
IS Seive ( mm)	Mass of soil retained ( gm)
20	0
10	0
4.75	92
2.40	247
1.2	369.5
600 $\mu$	181
300 $\mu$	94
150 $\mu$	9.5
75 $\mu$	1.5

Plot particle size distribution curve and determine coefficient of curvature and coefficient of uniformity . also identify type of soil ?

Answer :

1	2	3	4	5
IS Seive ( mm)	Mass of soil retained ( gm)	Cumulative mass retained(gm)	Cumulative % soil retained (gm) $= \text{Column 3} / 5000 \times 100$	% Finer
				Only 1 <sup>st</sup> value : 100 – Column no. 4
20	0	0	0	100 - 0 = 100
10	0	0	0	100 - 0 = 100
4.75	92	92	1.84	100 – 1.84 = 98.16
2.40	247	92 + 247 = 339	6.78	98.16 – 6.78 = 91.38
1.2	369.5	339 + 369.5 = 708.5	14.17	91.38 – 14.17 = 77.21
0.6	181	708.5 + 181 = 889.5	17.79	77.21 – 17.79 = 59.42
0.3	94	889.5 + 94 = 983.5	19.67	59.42 – 19.67 = 39.75
0.15	9.5	983.5 + 9.5 = 993	19.86	39.75 – 19.86 = 19.89
0.075	1.5	993 + 1.5 = 994.5	19.90	19.89 – 19.90 = 0
		$\sum 5000$	$\sum 100$	





From graph ; we get  $D_{10} = 0.1$  ;  $D_{30} = 0.2$  and  $D_{60} = 0.6$

$$\text{Hence , Coefficient of uniformity} = C_u = \frac{D_{60}}{D_{10}} = 0.6/0.1 = 6$$

$$\text{Coefficient of Curvature} = C_c = \frac{D_{30}}{D_{60} \times D_{10}} = 0.2/(0.6 \times 0.1) = 3.34$$

Since Coefficient of uniformity =  $C_u = 6$  which lies in between the values 2 to 15,

Hence, The soil is well graded soil .

**Problem 3)** the result of sieve analysis on dry soil sample weighing 1000 gm are given below.

IS Seive ( mm)	Mass of soil retained ( gm)
20	33
10	49
4.75	85
2	140
1	160
0.6	142
0.425	118
0.300	80
0.212	56
0.150	35
0.075	23

Plot particle size distribution curve and determine coefficient of curvature and coefficient of uniformity . also identify type of soil ?

1	2	3	4	5
IS Seive ( mm)	Mass of soil retained ( gm)	Cumulative mass retained(gm)	Cumulative % soil retained (gm) = $\frac{\text{Column 3}}{5889} \times 100$	% Finer
				Only 1 <sup>st</sup> value : 100 – Column no. 4
20	33	33	0.56	100 – 0.56 = 99.44
10	49	82	1.39	99.44 – 1.39 = 98.05
4.75	85	167	2.83	98.05 – 2.83 = 95.22
2	140	307	5.21	95.22 – 5.21 = 90
1	160	467	7.93	90 – 7.93 = 82.08
0.6	142	609	10.34	82.08 – 10.34 = 71.74
0.425	118	727	12.34	71.74 – 12.34 = 59.4
0.300	80	809	13.7	59.4 – 13.7 = 45.7
0.212	56	865	14.68	45.7 – 14.68 = 31
0.150	35	900	15.28	31 – 15.28 = 15.74
0.075	23	923	15.67	0
		$\sum 5889$	$\sum 100$	

From graph ; we get  $D_{10} = 0.11$  ;  $D_{30} = 0.2$  and  $D_{60} = 0.4$

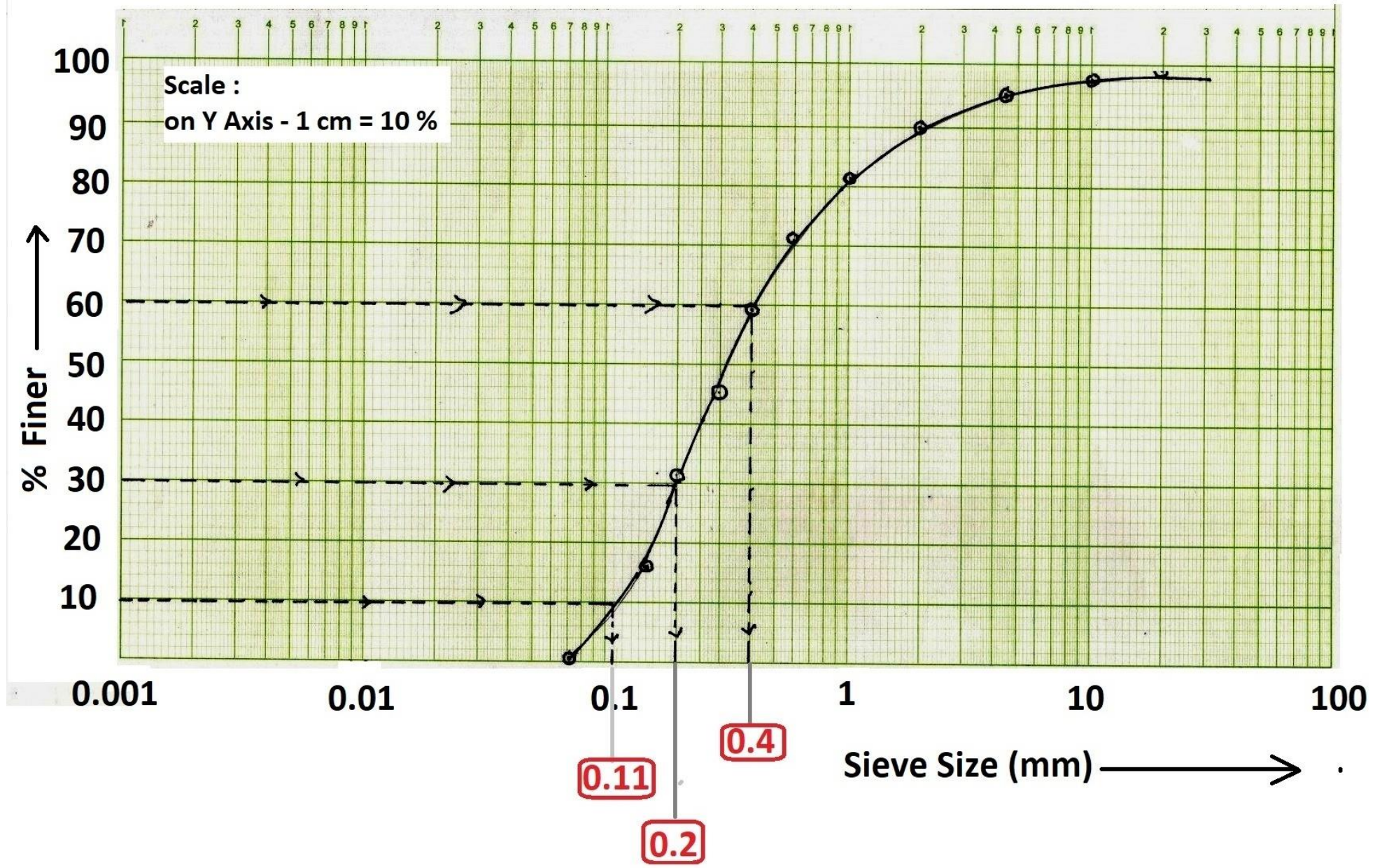
Hence , Coefficient of uniformity =  $C_u = \frac{D_{60}}{D_{10}} = 0.4/0.11 = 3.63$

Coefficient of Curvature =  $C_c = \frac{D_{30}}{D_{60} \times D_{10}} = 0.2/(0.4 \times 0.11) = 4.54$

Since Coefficient of uniformity =  $C_u = 3.63$  which lies in between the values 2 to 15,

Hence, The soil is well graded soil .





**Problem 4)** result of sieve analysis on the dry soil weighing 500 gms is as follow :

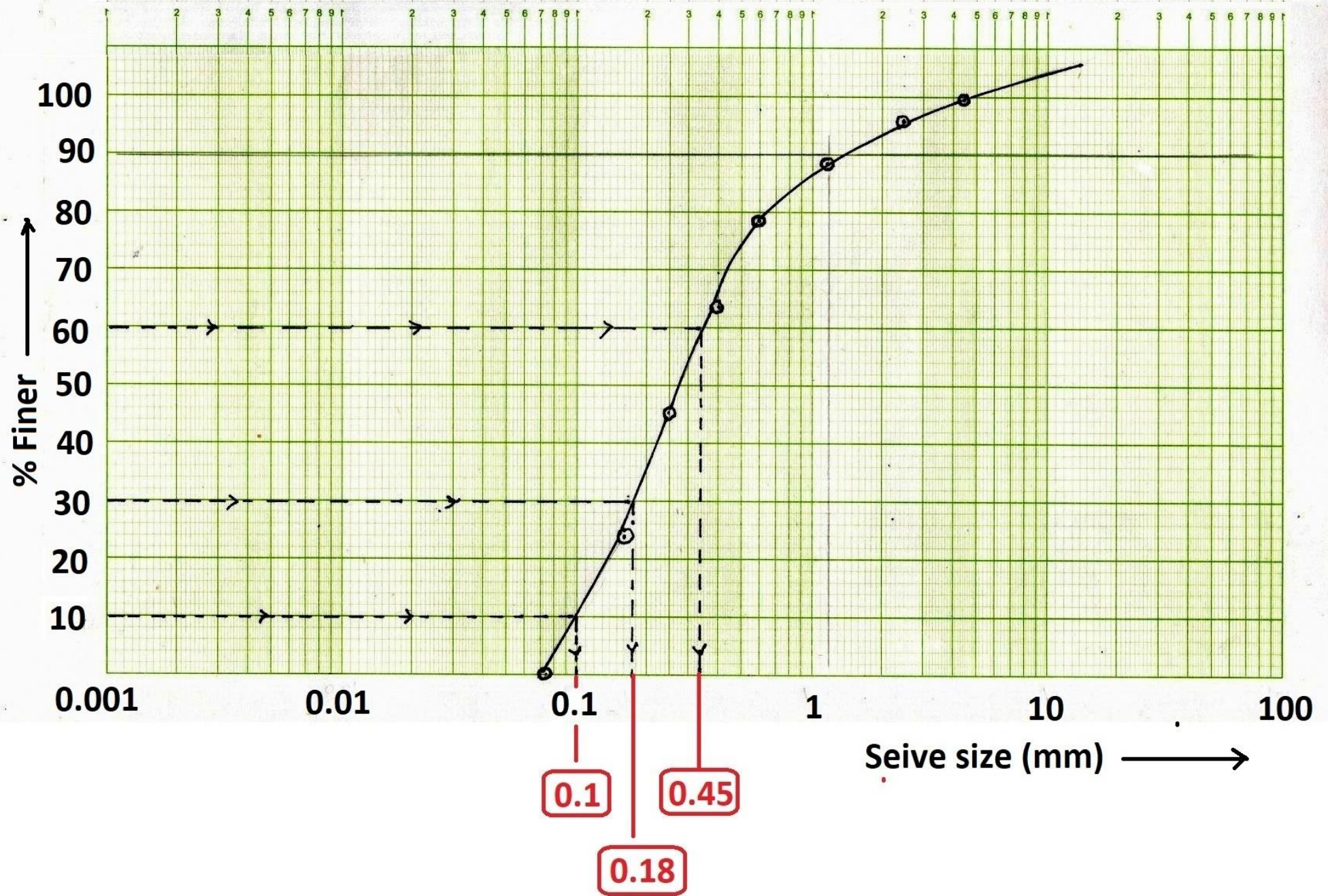
IS Seive ( mm)	Mass of soil retained ( gm)
4.75	9.36
2.4	53.75
1.2	78.10
600 $\mu$	83.22
425 $\mu$	85.80
300 $\mu$	76.82
150 $\mu$	67.02
75 $\mu$	33.83

Plot the particle size distribution curve and determine  $C_c$  and  $C_u$  . Identify the soil ?

**Answer :**

1	2	3	4	5
IS Seive ( mm)	Mass of soil retained ( gm)	Cumulative mass retained(gm)	Cumulative % soil retained (gm) $= \text{Column 3} / 2077.36 \times 100$	% Finer
				Only 1 <sup>st</sup> value : 100 – Column no. 4
4.75	9.36	9.36	0.450	99.55
2.4	53.75	63.11	3.038	96.512
1.2	78.10	141.21	6.79	89.72
0.6	83.22	224.43	10.80	78.922
0.425	85.80	310.23	14.94	63.98
0.300	76.82	387.05	18.63	45.35
0.150	67.02	454.07	21.85	23.502
0.075	33.83	488	23.49	0
		$\sum 2077.36$	$\sum 100$	





From graph ; we get  $D_{10} = 0.1$  ;  $D_{30} = 0.18$  and  $D_{60} = 0.45$

Hence , Coefficient of uniformity =  $C_u = \frac{D_{60}}{D_{10}} = 0.45/0.1 = 4.5$

Coefficient of Curvature =  $C_c = \frac{D_{30}}{D_{60} \times D_{10}} = 0.18/(0.45 \times 0.1) = 4$

Since Coefficient of uniformity =  $C_u = 4.5$  which lies in between the values 2 to 15,

Hence, The soil is well graded soil .

**Problem 5)** A liquid limit test on Casagrande's apparatus given the following results

No. of blows	Water content in %
16	52.5
20	49.5
30	46
43	41.8

Find out the liquid limit of soil ?

**Answer :**

the liquid limit of soil is found to be 48 %..... see graph



