Question #1

The geotechnical engineering behaviour of cohesive and cohesionless soils is different because of the forces that dominate the behaviour of each type of soil. Cohesive soils have low mass and high surface area, and so electrical forces between particles bond them together. But, gravity forces dominate the behaviour of cohesionless soils

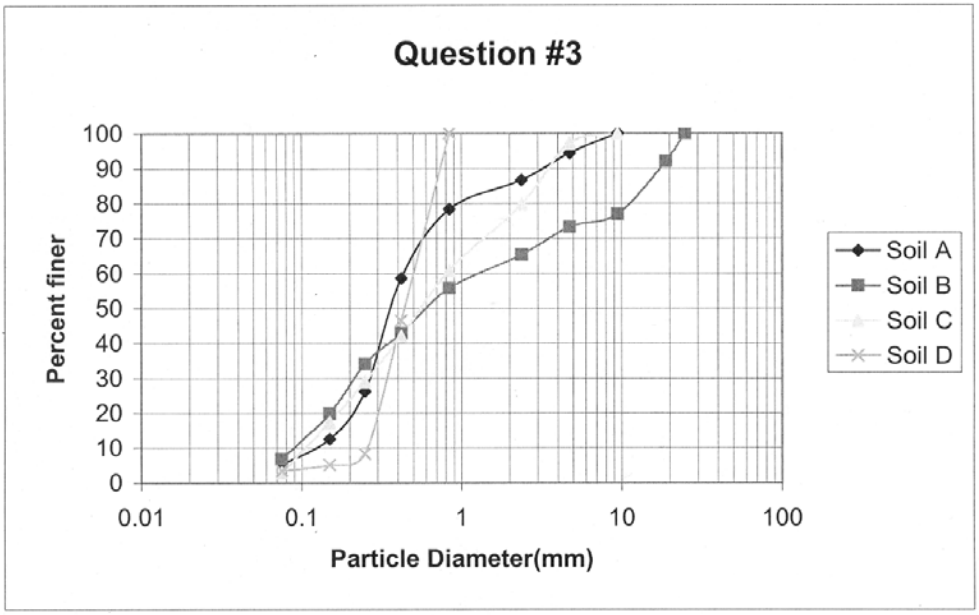
Question #2

Bentonite will have lower permeability when saturated, at the same void ratio and moisture content as Kaolinite. Bentonite will absorb water, because the attraction based on charge of the soil particles and water is strong.

Question #3

Metric Sieve Size	Soil A	Soil B	Soil C	Soil D
25	0	0	0	0
19	0	62.14	0	0
9.5	0	118.25	0	0
4.76	41.01	28.2	20	0
2.38	55.25	62	120	0
0.84	60.32	74.52	130	0
0.42	141.66	100.63	130	241.4
0.25	234	68.98	90	171.8
0.15	98.97	110.1	80	14.7
0.075	53.24	102.82	100	7.5
Pan	37.32	53.25	20	15.5
Sum	721.77	780.89	690	450.9

	Percent finer than by weight			
Metric Sieve Size	Soil A	Soil B	Soil C	Soil D
25	100	100	100	100
19	100	92.04241	100	100
9.5	100	76.89944	100	100
4.76	94.31813	73.28817	97.10145	100
2.38	86.66334	65.34851	79.71014	100
0.84	78.30611	55.80556	60.86957	100
0.42	58.67936	42.91898	42.02899	46.46263
0.25	26.25906	34.08547	28.98551	8.361056
0.15	12.54693	19.98617	17.3913	5.100909
0.075	5.170622	6.819142	2.898551	3.437569
Pan	5.170622	6.819142	2.898551	3.437569



Question #3

Soil A

$D_{10} = 0.12$ mm

$D_{30} = 0.27$ mm

$D_{60} = 0.44$ mm

$$\longrightarrow C_u = \frac{D_{60}}{D_{10}} = \frac{0.44}{0.12} = 3.66$$

$$C_c = \frac{D_{30}^2}{D_{60} \times D_{10}} = \frac{0.27^2}{0.44 \times 0.12} = 1.38$$

Percent Passing NO.4 = 41 %

$C_u < 6 \longrightarrow$ Poorly-graded $\longrightarrow$ with a little bit change in diameters estimation, it can be <u>well-graded</u>

Soil B

$D_{10} = 0.09$ mm

$D_{30} = 0.21$ mm

$D_{60} = 1.2$ mm

$$\longrightarrow C_u = \frac{1.2}{0.09} = 13.33$$

$$C_c = \frac{0.21^2}{1.2 \times 0.09} = 0.408$$

$C_c < 1 \longrightarrow$ S a P- graded $\longrightarrow$ Poorly-graded

Question #3

Soil C

$D_{10} = 0.12$ mm

$D_{30} = 0.27$ mm

$D_{60} = 0.82$ mm

$$\longrightarrow \quad C_u = \frac{0.82}{0.12} = 6.88$$

$$C_c = \frac{0.27^2}{0.12 \times 0.82} = 0.75$$

According to criteria $C_c < 1 \longrightarrow$ Poorly-graded

But if we look at the graph and with change of our estimates it can be well-graded

Soil D

$D_{10} = 0.27$ mm

$D_{30} = 0.33$ mm

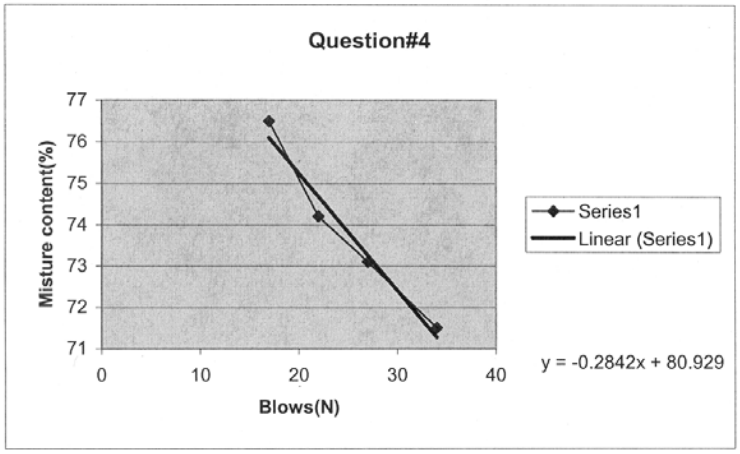
$D_{60} = 0.5$ mm

$$\longrightarrow \quad C_u = \frac{0.5}{0.27} = 1.85$$

$$C_c = \frac{0.32^2}{0.5 \times 0.27} = 0.75$$

$C_u < 4$, $C_c < 1$ $\longrightarrow$ Poorly-graded

Question #4



a) Reading from the graph, the Liquid Limit is 73.8% moisture content at 25 blows.

The Plastic limit (PL) is 23.16% moisture content, attained from averaging the provided data from each trial.

$$SL = \frac{21.3 - 19.9}{19.9 - 12.6} x100 = 19.2\%$$

Question #4

Plasticity Index (PI) = Liquid Limit - Plastic Limit

$= 73.8 - 23.2 = 50.6$

$$\text{Activity (A)} = \frac{\text{PI}}{\text{Percent clay - size fraction by weight}}$$

$$A = \frac{50.6}{55} = 0.92$$

c) To comment on the expected type of clay, take a look at your notes. In one of the charts, you can determine the type of clay with Atterberg limits.

LL = 73.8 %
PL = 23.2 %
PI = 50.6

$\Longrightarrow$ Illite.

$$A = \frac{50.6}{55} = 0.92$$

c) To comment on the expected type of clay, take a look at your notes. In one of the charts, you can determine the type of clay with Atterberg limits.

LL = 73.8 %
PL = 23.2 %
PI = 50.6

$\Longrightarrow$ Illite.

Question # 5

Soil 1

Percent Passing No.200 = 44% ⟶ {S, G}

Coarse fraction = 100 - 44 = 56%

Percent Passing No.4 = 100% ⟶ S

Percent of fines = 44% > 12%

If you look at the soil Particle distribution 41% of total 44% fines are between 75 μm and 2 μm

⟶ SM

Soil 2

Percent Passing No.200 = 77% ⟶ {C, M}

LL = 98% > 50%

PI = LL - PL = 98 - 25 = 73%

Using the Plastic chart

A-Line ⟶ PI = 0.73 (LL - 20) = 0.73 (98 - 20) = 56.9

73% > 56.9% ⟶ Above A-Line ⟶ CH

Question #5

Soil 3

Percent Passing NO. 200 = 100% $\longrightarrow \begin{cases} C \\ M \end{cases}$

LL = 73.8% > 50% $\longrightarrow$ H

PI = LL - PL = 73.8 - 23.4 = 50.4

Using the Plastic chart

A-Line $\rightarrow$ PI = 0.73 (LL - 20) = 0.73 (53.8) = 39.27

$\longrightarrow$ 50.4 > 39.27 $\longrightarrow$ Above A-Line $\longrightarrow$ **CH**