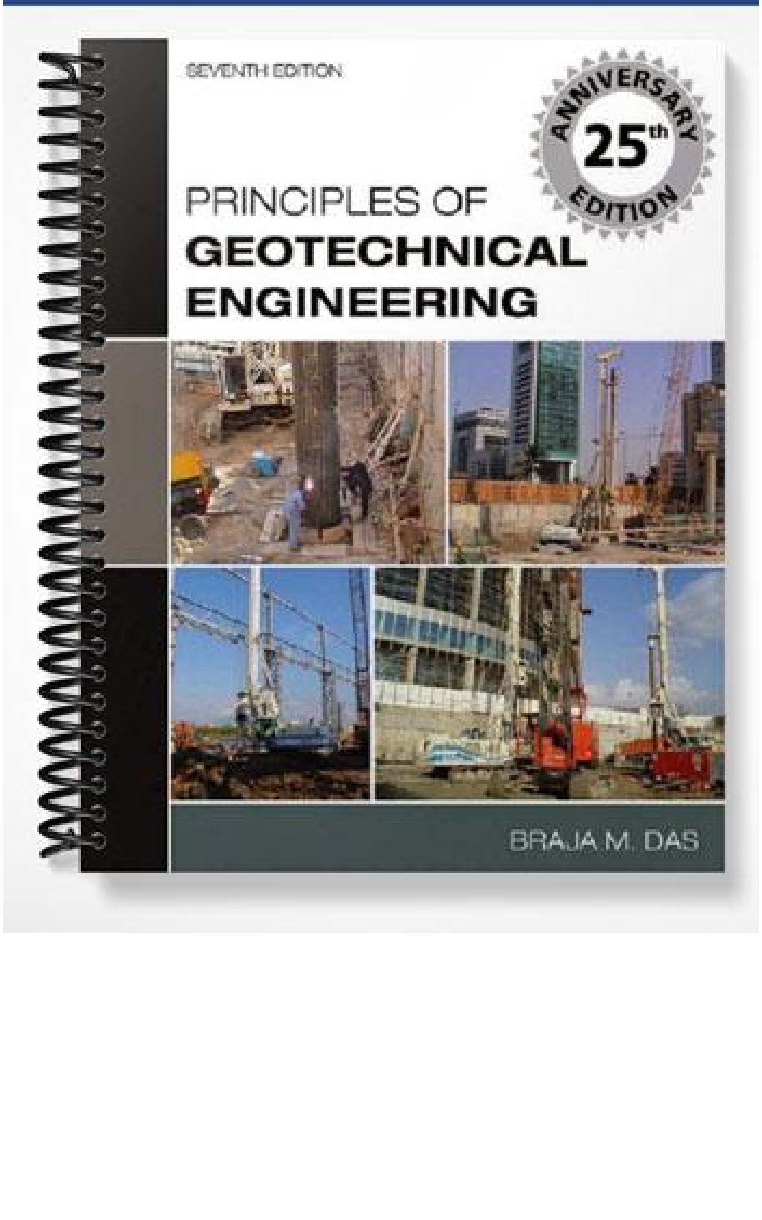
SOLUTIONS MANUAL



Chapter 2

2.1 $C_u = \frac{D_{60}}{D_{10}} = \frac{0.41}{0.08} = \mathbf{5.13}$

$$C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})} = \frac{(0.22)^2}{(0.08)(0.41)} = \mathbf{1.48}$$

2.2 $C_u = \frac{D_{60}}{D_{10}} = \frac{1.81}{0.24} = \mathbf{7.54}$

$$C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})} = \frac{(0.82)^2}{(0.24)(1.81)} = \mathbf{1.55}$$

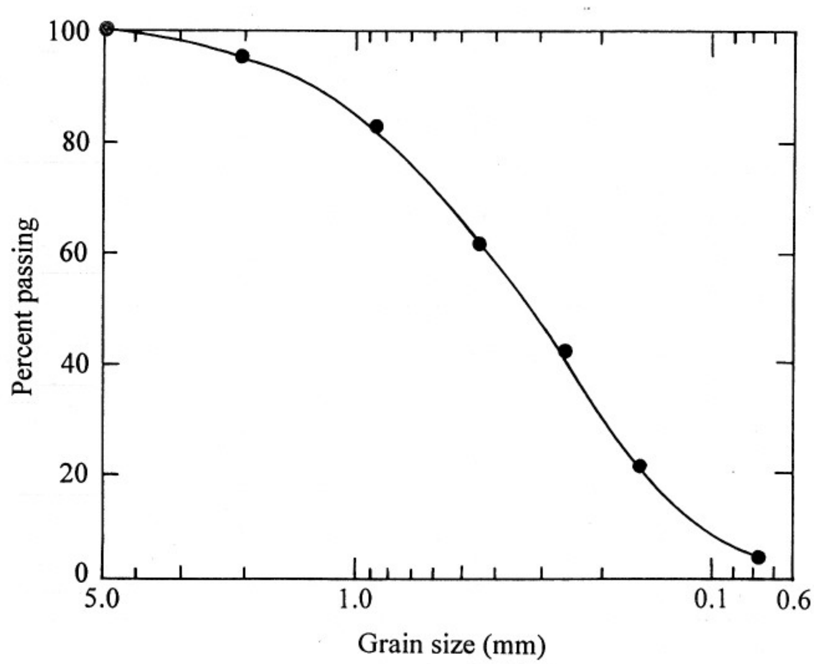
2.3 $C_u = \frac{D_{60}}{D_{10}} = \frac{0.78}{0.18} = \mathbf{4.33}$

$$C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})} = \frac{(0.32)^2}{(0.18)(0.78)} = \mathbf{0.73}$$

2.4 a.

Sieve no.	Mass of soil retained on each sieve (g)	Percent retained on each sieve	Percent finer
4	0.0	0.0	**100.0**
10	18.5	4.4	**95.6**
20	53.2	12.6	**83.0**
40	90.5	21.5	**61.5**
60	81.8	19.4	**42.1**
100	92.2	21.9	**20.2**
200	58.5	13.9	**6.3**
Pan	26.5	6.3	**0**
	Σ 421.2 g		

The grain-size distribution is shown.



b. D_{60} = **0.4 mm**; D_{30} = **0.22 mm**; D_{10} = **0.12 mm**

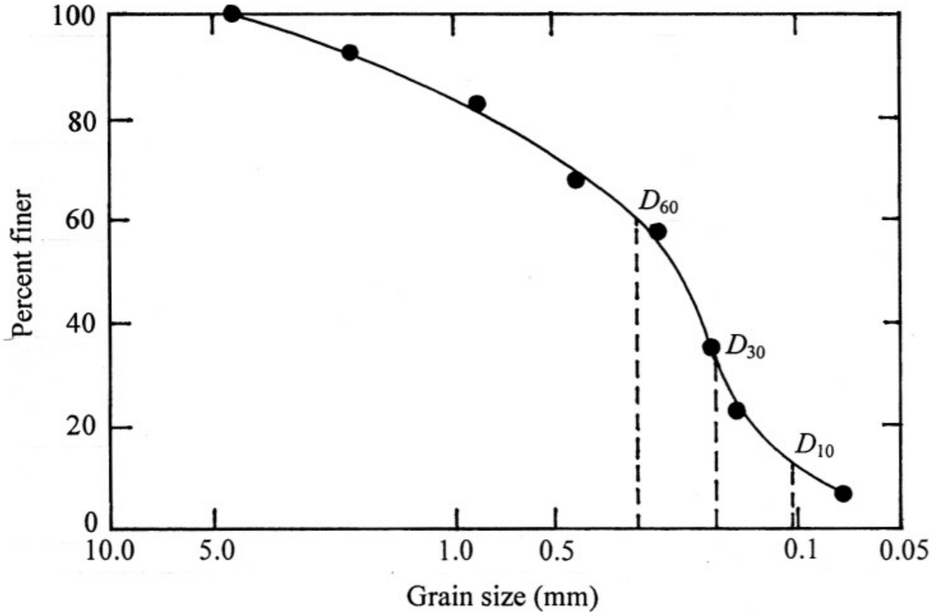
c. $C_u = \dfrac{D_{60}}{D_{10}} = \dfrac{0.4}{0.12} = \mathbf{3.33}$

d. $C_c = \dfrac{(D_{30})^2}{(D_{10})(D_{60})} = \dfrac{(0.22)^2}{(0.4)(0.12)} = \mathbf{1.01}$

2.5 a.

Sieve no.	Mass of soil retained on each sieve (g)	Percent retained on each sieve	Percent finer
4	0	0	**100**
10	44	7.99	**92.01**
20	56	10.16	**81.85**
40	82	14.88	**66.97**
60	51	9.26	**57.71**
80	106	19.24	**38.47**
100	92	16.70	**21.77**
200	85	15.43	**6.34**
Pan	35	5.34	**0**
	Σ 551 g		

The grain-size distribution is shown in the figure.



b. From the graph: D_{60} = **0.3 mm**; D_{30} = **0.17 mm**; D_{10} = **0.11 mm**

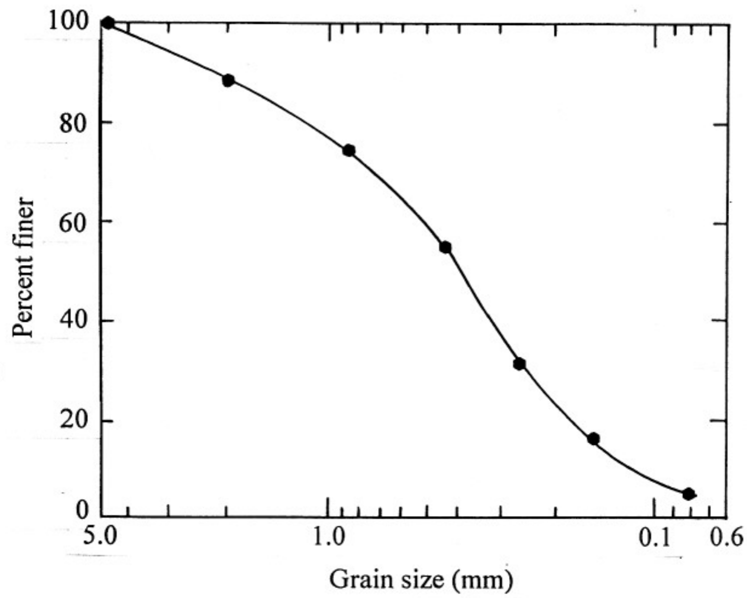
c. $C_u = \frac{0.3}{0.11} = \mathbf{2.73}$

d. $C_c = \frac{(0.17)^2}{(0.11)(0.3)} = \mathbf{0.88}$

2.6 a.

Sieve no.	Mass of soil retained on each sieve (g)	Percent retained on each sieve	Percent finer
4	0	0	**100**
10	41.2	10.7	**89.3**
20	55.1	14.2	**75.1**
40	80.0	20.8	**54.3**
60	91.6	23.8	**30.5**
100	60.5	15.7	**14.8**
200	36.5	9.2	**5.6**
Pan	21.5	5.6	**0**
	Σ 385.5 g		

The grain-size distribution is shown.



b. D_{60} = **0.50 mm**; D_{30} = **0.26 mm**; D_{10} = **0.14 mm**

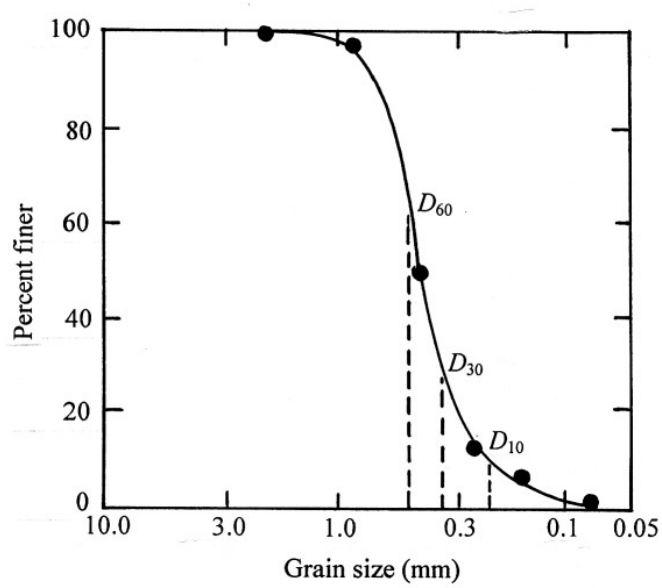
c. $C_u = \frac{D_{60}}{D_{10}} = \frac{0.50}{0.14} = \mathbf{3.57}$

d. $C_c = \frac{(D_{30})^2}{(D_{10})(D_{60})} = \frac{(0.26)^2}{(0.5)(0.14)} = \mathbf{0.97}$

2.7 a.

Sieve no.	Mass of soil retained on each sieve (g)	Percent retained on each sieve	Percent finer
4	0	0	**100**
6	0	0	**100**
10	0	0	**100**
20	9.1	1.82	**98.18**
40	249.4	49.88	**48.3**
60	179.8	35.96	**12.34**
100	22.7	4.54	**7.8**
200	15.5	3.10	**4.7**
Pan	23.5	4.70	**0**
	Σ500 g		

The grain-size distribution is shown.

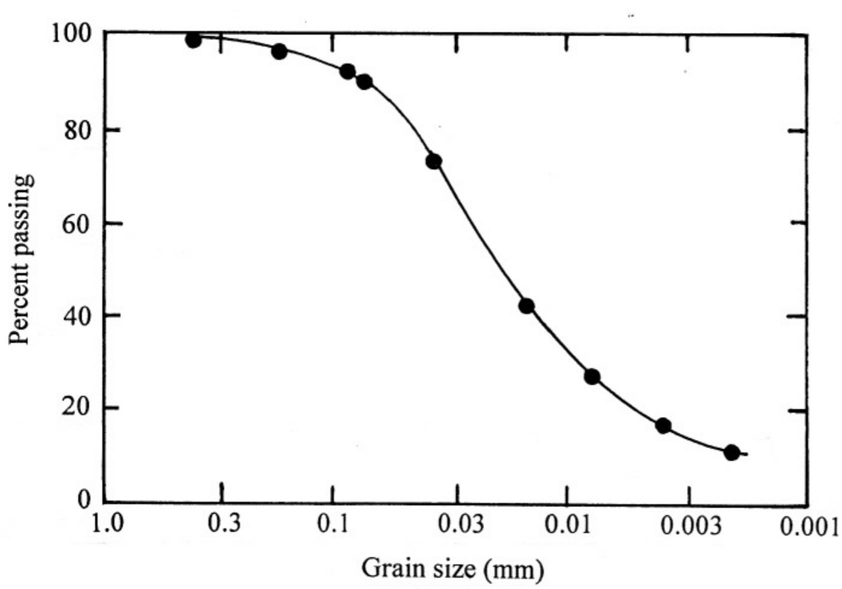


b. From the graph: D_{60} = **0.48 mm**; D_{30} = **0.33 mm**; D_{10} = **0.23 mm**.

c. $C_u = \dfrac{0.48}{0.23} = \mathbf{2.09}$

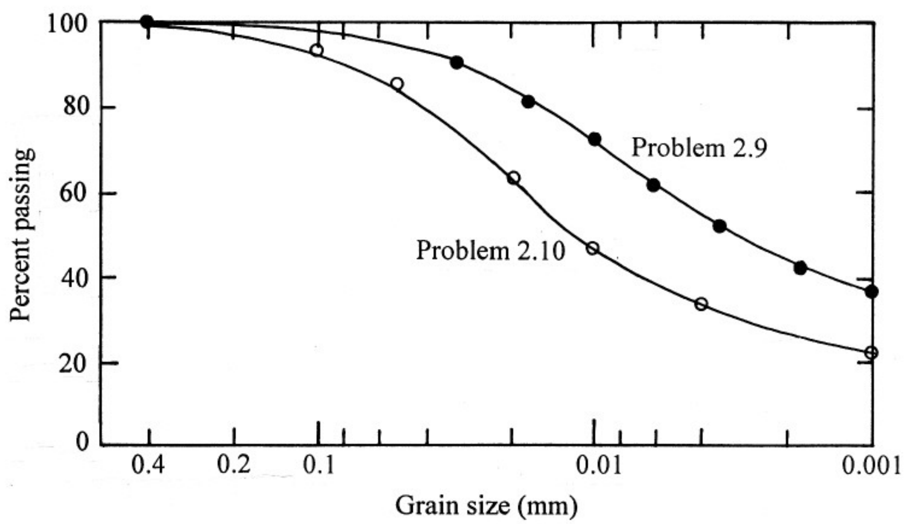
d. $C_c = \dfrac{(0.33)^2}{(0.48)(0.23)} = \mathbf{0.99}$

2.8 a. The grain-size distribution curve is shown.



b.	Percent passing 2 mm = 100 Percent passing 0.06 mm = 84 Percent passing 0.002 mm = 11	GRAVEL: 100 – 100 = **0%** SAND: 100 – 84 = **16%** SILT: 84 – 11 = **73%** CLAY: 11 – 0 = **11%**
c.	Percent passing 2 mm = 100 Percent passing 0.05 mm = 80 Percent passing 0.002 mm = 11	GRAVEL: 100 – 100 = **0%** SAND: 100 – 80 = **20%** SILT: 80 – 11 = **69%** CLAY: 11 – 0 = **11%**
d.	Percent passing 2 mm = 100 Percent passing 0.075 mm = 90 Percent passing 0.002 mm = 11	GRAVEL: 100 – 100 = **0%** SAND: 100 – 90 = **10%** SILT: 90 – 11 = **79%** CLAY: 11 – 0 = **11%**

2.9 The grain-size distributions are shown in the figure for Problems 2.9 and 2.10.



Percent passing 2 mm = 100 Percent passing 0.05 mm = 94 Percent passing 0.002 mm = 42	GRAVEL: 100 – 100 = **0%** SAND: 100 – 94 = **6%** SILT: 94 – 42 = **52%** CLAY: 42 – 0 = **42%**

2.10	Percent passing 2 mm = 100 Percent passing 0.05 mm = 83 Percent passing 0.002 mm = 26	GRAVEL: 100 – 100 = **0%** SAND: 100 – 83 = **17%** SILT: 83 – 26 = **57%** CLAY: 26 – 0 = **26%**

2.11 G_s = 2.60; temperature = 24°; R = 43; time = 60 min. Referring to Table 2.7,

L = 9.2.

Eq. (2.5): $D\,(\text{mm}) = K\sqrt{\frac{L\,(\text{cm})}{t\,(\text{min})}}$

From Table 2.6 for G_s = 2.60 and temperature = 24°, K = 0.01321.

$$D = 0.01321\sqrt{\frac{9.2}{60}} = \mathbf{0.0052\ mm}$$

2.12 For G_s = 2.70 and temperature = 23°, K = 0.01297, R = 25 (Table 2.6).

L = 12.2 (Table 2.7).

$$D\,(\text{mm}) = K\sqrt{\frac{L\,(\text{cm})}{t\,(\text{min})}} = 0.01297\sqrt{\frac{12.2}{120}} = \mathbf{0.0041\ mm}$$