Chapter 5

5.1   Refer to Figure 5.1.

Soil	Classification
A	**Clay**
B	**Sandy clay**
C	**Loam**
D	**Sandy clay and sandy clay loam (borderline)**
E	**Sandy loam**

5.2   <u>Soil 1</u>: $F_{200} = 50$; $PI = 38 - 29 = 9$. From Table 5.1, soil is A-4.

Eq. (5.1): $GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$

$$= (50 - 35)[0.2 + 0.005(38 - 40)] + 0.01(50 - 15)(9 - 10)$$

$$= 2.8 \approx 3$$

Classification: **A-4(3)**

<u>Soil 2</u>: $F_{200} = 80$. $PI = 56 - 23 = 33$. Soil is A-7-6.

Eq. (5.1): $GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$

$$= (80 - 35)[0.2 + 0.005(56 - 40)] + 0.01(80 - 15)(33 - 10)$$

$$= 27.55 \approx 28$$

Classification: **A-7-6(28)**

<u>Soil 3</u>: $F_{200} = 65$. $LL = 37$; $PI = 37 - 22 = 15$. From Table 5.1, soil is A-6.

$$GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$$

$$= (65 - 35)[0.2 + 0.005(37 - 40)] + 0.01(65 - 15)(15 - 10)$$

$$= 8.05 \approx 8$$

Classification: **A-6(8)**

<u>Soil 4</u>: $F_{200} = 45$. $LL = 28$; $PI = 28 - 20 = 8$. From Table 5.1, soil is A-4.

$$GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$$

$$= (45 - 35)[0.2 + 0.005(28 - 40)] + 0.01(45 - 15)(8 - 10)$$

$$= 0.8 \approx 1$$

Classification: **A-4(1)**

<u>Soil 5</u>: $F_{200} = 62$. $LL = 43$; $PI = 43 - 28 = 15$. From Table 5.1, soil is A-7-6.

$$GI = (F_{200} - 35)[0.2 + 0.005(LL - 40)] + 0.01(F_{200} - 15)(PI - 10)$$
$$= (62 - 35)[0.2 + 0.005(43 - 40)] + 0.01(62 - 15)(15 - 10)$$
$$= 8.155 \approx 8$$

Classification: **A-7-6(8)**

<u>Soil 6</u>: $F_{200} = 6$. From Table 5.1, the soil is A-1-a.

$$GI = 0$$

Classification: **A-1-a(0)**

<u>Soil 7</u>: $F_{200} = 30$. $LL = 32$; $PI = 32 - 24 = 8$. From Table 5.1, soil is A-2-4.

$$GI = 0$$

Classification: **A-2-4(0)**

<u>Soil 8</u>: $F_{200} = 34$. $LL = 37$; $PI = 37 - 25 = 12$. From Table 5.1, soil is A-2-6.

Eq. (5.2): $GI = 0.01(F_{200} - 15)(PI - 10) = 0.01(34 - 15)(12 - 10) = 0.38 \approx 0$

Classification: **A-2-6(0)**

<u>Soil 9</u>: $F_{200} = 8$. From Table 5.1, the soil is A-3.

$$GI = 0$$

Classification: **A-3(0)**

<u>Soil 10</u>: $F_{200} = 32$. $LL = 44$; $PI = 44 - 35 = 9$. From Table 5.1, the soil is A-2-5.

$$GI = 0$$

Classification: **A-2-5(0)**

5.3   <u>Soil 1</u>: 3% passing No. 200 sieve; 90% passing No. 4 sieve. So, it is sandy soil.

From Table 5.2, it is SW or SP. $C_u = 4.48 < 6$, so the symbol is **SP**.

Gravel fraction $= 100 - 94 = 6\%$.

From Figure 5.4, group name is **poorly graded sand**.

Soil 2: 77% passing No. 200 sieve, so it is fine grained soil. $LL = 63$; $PI = 25$.

From Table 5.2 and Figure 5.3, the group symbol is **MH**.

Plus No. 200 sieve is $100 - 77 = 23\% < 30\%$; % sand = 23%;

% gravel = 0%.

From Figure 5.5, the group name is **elastic silt with sand.**

Soil 3: 86% passing No. 200 sieve, so it is fine grained soil. $LL = 55$; $PI = 28$.

From Table 5.2 and Figure 5.3, the group symbol is **CH**.

Plus No. 200 sieve is $100 - 86 = 14$; gravel fraction = 0%;

sand fraction = 14%.

From Figure 5.5, the group name is **fat clay**.

Soil 4: 45% passing No. 200 sieve, so it is coarse grained soil. 100% passing

No. 4 sieve, so it is sandy soil. From Table 5.2, it is SM or SC.

$LL = 36$; $PI = 22$. From Figure 5.3, the group symbol is **SC**.

From Figure 5.4, the group name is **clayey sand**.

Soil 5: 48% passing No. 200 sieve and 92% passing No. 4 sieve, so it is sandy

soil (SC or SM).

$LL = 30$; $PI = 8$.

From Table 5.2 and Figure 5.3, the group symbol is **SC**.

Gravel fraction is $100 - 92 = 8\%$.

From Figure 5.4, the group name is **clayey sand**.

Soil 6: 40% passing No. 200 sieve and 60% passing No. 4 sieve. So,

Gravel fraction = $100 - 60 = 40\%$; coarse fraction = $100 - 40 = 60\%$;

Sand fraction = $60 - 40 = 20\%$. $LL = 26$; $PI = 4$.

From Table 5.2 and Figure 5.3, the group symbol is **GM-GC**.

From Figure 5.4, the group name is **silty clayey gravel with sand**.

Soil 7: 76% passing No. 200 sieve, so it is fine grained soil. $LL = 60$; $PI = 32$.

From Table 5.2 and Figure 5.2, the group symbol is **CH**.

From Figure 5.5, the group name is **fat clay with sand**.

5.4   a.   13% passing No. 200 sieve; 38% passing No. 40 sieve; 90% passing No. 10

           sieve. $PI = 23 - 19 = 4$. Referring to Table 5.1, the soil is A-1-b. $GI = 0$.

           So the soil is **A-1-b(0)**.

        b.   Coarse fraction $= 100 - 13 = 87\%$

           Gravel fraction $= 100 - 100 = 0\%$

           Sand fraction $= 87 - 0 = 87\%$

           $LL = 23$; $PI = 4$. From Table 5.2 and Figure 5.3, the group symbol is **SC**.

           From Figure 5.4, the group name is **clayey sand**.