APPENDIX D
Solutions to Practice Problems

1. \[ F = P(F/P, 6\%, 9) = (\$250)(1.6895) \]
   \[ = \boxed{\$422} \]

2. \[ P = F(P/F, 6\%, 5) = (\$2000)(0.7473) \]
   \[ = \boxed{\$1495} \]

3. \[ P = F(P/F, 6\%, 7) = (\$2000)(0.6651) \]
   \[ = \boxed{\$1330} \]

4. \[ A = P(A/P, 6\%, 10) = (\$50)(0.1359) \]
   \[ = \boxed{\$6.80} \]

5. \[ F = A(F/A, 6\%, 10) = (\$20,000)(13.1808) \]
   \[ = \boxed{\$263,600} \]

6. \[ A = F(A/F, 6\%, 6) = (\$5000)(0.1434) \]
   \[ = \boxed{\$717} \]

7. \[ P = A(P/A, 6\%, 7) = (\$400)(5.5824) \]
   \[ = \boxed{\$2233} \]

8. \[ F = (\$500)(F/P, 4\%, 10) + (\$700)(F/P, 4\%, 8) + (\$900)(F/P, 4\%, 6) \]
   \[ = (\$500)(1.4802) + (\$700)(1.3686) + (\$900)(1.2653) \]
   \[ = \boxed{\$2837} \]
9. \[ i = \frac{r}{k} = \frac{6\%}{2} = 3\% \]
\[ n = (2)(8) = 16 \]
\[ F = P(F/P, 3\%, 16) = ($550)(1.6047) = $883 \]

10. \[ P = F(P/F, i\%, 5) \]
\[ (P/F, i\%, 5) = \frac{P}{F} = \frac{50}{75} = 0.6667 \]

From the table,
\[ (P/F, 8\%, 5) = 0.6806 \]
\[ (P/F, 9\%, 5) = 0.6499 \]
\[ i = 8\% + (9\% - 8\%) \left( \frac{0.6667 - 0.6806}{0.6499 - 0.6806} \right) = 8.45\% \]

\( (F/P, i, 5) \) can also be solved directly for \( i \).
\[ (1 + i)^5 = 1.5 \]
\[ i = 0.08447 (8.447\%) \]

11. \[ \phi = \frac{r}{k} = \frac{4\%}{12} = 0.3333\% \]
\[ n = (30)(12) = 360 \]
\[ A = F(A/F, 0.3333\%, 360) = F \left[ \frac{i}{(1 + i)^n - 1} \right] \]
\[ = ($50,000) \left[ \frac{0.00333}{(1 + 0.00333)^{360} - 1} \right] = $72.05 \]

12. \[ n = (18)(12) = 216 \]
\[ F = A(F/A, 0.33\%, 216) = A \left[ \frac{(1 + i)^n - 1}{i} \right] \]
\[ = ($72.56) \left[ \frac{(1 + 0.0033)^{216} - 1}{0.0033} \right] \]
\[ = ($72.56)(314.33) = $22,808 \]
13. \[ A = F(A/F, 5\%, 19) = (\$20,000)(0.0327) = \boxed{\$654} \]

14. It helps to draw a cash flow diagram. Present worth as of January 1, year 0 of the deposits is

\[ P_{\text{deposits}} = (\$50)(P/A, 6\%, 10) = (\$50)(7.3601) = \$368.00 \]

Present worth as of January 1, year 0 of the withdrawal is

\[ P_{\text{withdrawal}} = (A_w)[(P/A, 6\%, 19) - (P/A, 6\%, 14)] = (A_w)(11.1581 - 9.2950) = 1.8631A_w \]

Since the last withdrawal exhausts the fund,

\[ P_{\text{deposits}} = P_{\text{withdrawals}} = \$368.00 = 1.8631A_w \]

\[ A_w = \boxed{\$197.52} \]

15. (a) Number of compounding periods:

\[ n = \frac{\$2000}{\$400} = 5 \]

Effective interest rate:

\[ i = \frac{r}{k} = \frac{0.10}{12} = 0.0083 \]

payment = monthly payment + interest on unpaid balance

First month:

\[ \text{payment} = \$400 + (\$2000)(0.0083) = \boxed{\$417} \]

Second month:

\[ \text{payment} = \$400 + (\$2000 - \$400)(0.0083) = \boxed{\$413} \]
Third month:

\[
payment = 400 + (2000 - 800)(0.0083) = \boxed{410}
\]

Fourth month:

\[
payment = 400 + (2000 - 1200)(0.0083) = \boxed{407}
\]

Fifth month:

\[
payment = 400 + (2000 - 1600)(0.0083) = \boxed{403}
\]

(b) Principal remaining after the third payment is

\[
2000 - (3)(400) = \boxed{800}
\]

(c) Interest on the fourth payment is

\[
407 - 400 = \boxed{7}
\]

16. \[P = -12,000 + (2000)(P/F, 10\%, 10) - (1000)(P/A, 10\%, 10)
- (200)(P/G, 10\%, 10)
= -12,000 + (2000)(0.3855) - (1000)(6.1446) - (200)(22.8913)
= \boxed{-21,950}\]

17. Amount of money saved per year:

\[
A = \left(\frac{40,000 \text{ pieces}}{\text{yr}}\right) \left(\frac{7 \text{ sec}}{\text{piece}}\right) \left(\frac{\text{hr}}{3600 \text{ sec}}\right) \left(\frac{\$15.00}{\text{hr}}\right)
= 1166.67/\text{yr}
\]

For a 3-year life, \(n = 3\), the maximum purchase price, \(P\), is

\[
P = A(P/A, 8\%, 3) = (1166.67)(2.5771)
= \boxed{3006.63}
\]
18. The service has an infinite life; the capitalized cost, CC, is

\[
CC = \text{initial cost} + \frac{\text{actual cost}}{i} = \$100,000 + \frac{\$18,000}{0.08} = \$325,000
\]

19. (a) Brand A:

\[
CC = \$120 + \frac{(\$400)(1 - 0.93)}{0.10} = \$400
\]

Brand B:

\[
CC = \$70 + \frac{(\$400)(1 - 0.87)}{0.10} = \$590
\]

(b) Brand A is superior

20. \[
\begin{align*}
\text{EUAC} & = C_1(A/P, 6\%, 5) - S_1(A/F, 6\%, 5) + C_2(A/P, 6\%, 5) \\
& \quad - S_2(A/F, 6\%, 5) + \text{maintenance} \\
& = (\$17,000)(0.2374) - (\$14,000)(0.1774) + (\$5000)(0.2374) \\
& \quad - (\$2500)(0.1774) + \$200 \\
& = \$2495.70
\end{align*}
\]

21. Aluminum:

\[
\begin{align*}
\text{EUAC} & = (\$6000)(A/P, 10\%, 50) \\
& = (\$6000)(0.1009) = \$605
\end{align*}
\]

Shingles:

\[
\begin{align*}
\text{EUAC} & = (\$3500)(A/P, 10\%, 15) \\
& = (\$3500)(0.1315) = \$460
\end{align*}
\]

shingles are superior
22. Alternative A:

\[
\text{EUAC} = C(A/P, 12\%, 20) + \text{other annual costs} - S(A/F, 12\%, 20)
\]
\[
= ($90,000)(0.1339) + ($3000 + $2200 + $400) - ($10,000)(0.0139)
\]
\[
= $17,512
\]

Alternative B:

\[
\text{EUAC} = ($60,000)(0.1339) + ($5000 + $3000) - ($6000)(0.0139)
\]
\[
= $15,951
\]

Alternative B is best

23. 

\[
A = \text{(amount of loan)}(A/P, i\%, 12)
\]
\[
= ($14,000 - $4000)(A/P, i\%, 12)
\]
\[
(A/P, i\%, 12) = \frac{A}{\$10,000} = \frac{\$1200}{\$10,000} = 0.1200
\]

From the table,

\[
(A/P, 6\%, 12) = 0.1193
\]
\[
(A/P, 7\%, 12) = 0.1259
\]

\[
i = 6\% + (7\% - 6\%) \left( \frac{0.1200 - 0.1193}{0.1259 - 0.1193} \right) = 6.1\% 
\]

24. 

\[
F = ($14,000 + $1000)(F/P, 10\%, 10)
\]
\[
+ [($150 + $250 - ($75)(12)] (F/A, 10\%, 10)
\]
\[
= ($15,000)(2.5937) - ($500)(15.9374)
\]
\[
= $30,937
\]

25. 

\[
P_A(0.08) = P_B(0.15) + (P_A - P_B)i
\]

\[
i = \frac{P_A(0.08) - P_B(0.15)}{P_A - P_B}
\]
\[
= \frac{($40,000)(0.08) - ($10,000)(0.15)}{\$40,000 - \$10,000}
\]
\[
= 0.0567 = 5.67\%
\]
26. (a) \[ B - C = \$500,000 - \$175,000 - \$50,000 \]
   \[ = \$275,000 \]

   (b) \[ \frac{B}{C} = \frac{\$500,000 - \$50,000}{\$175,000} = 2.57 \]

27. (a) \[ \frac{B}{C} = \frac{\$1,500,000 - \$300,000}{\$1,000,000} = 1.2 \]

   (b) \[ B - C = \$1,500,000 - \$300,000 - \$1,000,000 \]
   \[ = \$200,000 \]