Review Questions and Answers for the Final Exam
AY 2020/2021 Winter Term
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Chapter 5 - Analysis of Independent Projects (Continued)

5.1. [Answer] (b)

Given: cash flow series in perpetuity, MARR = 10%

Find: capitalized equivalent worth

Approach: The original cash flow series can be divided into two series: the first one is the $400 series in perpetuity and the second one is the $100 series in perpetuity starting after 10 years.

$$\begin{aligned} CE(10\%) &= \frac{\$400}{0.10} + \frac{\$100}{0.10}(P/F, 10\%, 10) \\ &= \$4000 + \$386 \\ &= \$4386 \end{aligned}$$

5.2. [Answer] (b)

Given: cash flow series, MARR = 10%, $N = \infty$

Find: capitalized equivalent worth

Approach: Since there are repeating patterns over time, our task is to convert the cash flow series within the pattern into the equivalent annual values. This is equivalent to finding the equivalent annual values over the entire series.

$$\begin{aligned} PW(10\%)_{\text{first cycle}} &= \$100(P/A, 10\%, 4) + \$100(P/A, 10\%, 2) \\ &= \$490.54 \\ AE(10\%) &= \$490.54(A/P, 10\%, 4) \\ &= \$154.75 \\ CE(10\%) &= \frac{\$154.75}{0.10} \\ &= \$1547.50 \end{aligned}$$

5.3. [Answer] (d)

Given: I = $20,000, N = 10 years, S = $0, Net annual cash flow (A_n) = $5000, MARR = 15%

Find: the number years to operate to become profitable

$$\begin{aligned} PW(15\%) &= -\$20{,}000 + \$5000(P/A, 15\%, N) \\ &= 0 \\ (P/A, 15\%, N) &= 4 \\ N &= 6.5561 \end{aligned}$$

Comments: The question is equivalent to finding the discounted payback period, or looking for N that makes $PB(15\%)n = 0$.

5.4. [Answer] (a)

Given: financial data given above, $N = \infty$, MARR = 10%, $PW(10\%)$ = $100,000

Find: required investment to make the project break even

Approach:

• Required investment ($P1$):

• Equivalent revenue streams ($P2$):

$$\begin{aligned} P_2 &= \$10{,}000(P/A, 10\%, 9 + \$5000(P/G, 10\%, 9) \\ &\quad + \frac{\$52{,}000}{0.10}(P/F, 10\%, 9) \\ &= \$375{,}228 \end{aligned}$$

• Equivalent machine overhaul expenses ($P3$):

$$\begin{aligned} P_3 &= \frac{\$40{,}000(A/F, 10\%, 10)}{0.10} \\ &= \frac{\$2508}{0.10} \\ &= \$25{,}080 \end{aligned}$$

• Required investment ($P1$):

$$\begin{aligned} P &= P_1 + P_2 + P_3 \\ \$100{,}000 &= P_1 + \$375{,}228 - \$25{,}080 \\ P_1 &= -\$250{,}148 \end{aligned}$$

5.5. [Answer] (b)

Given: A = \$1,000, N = 3, and MARR = 12%

Find: AE(12%)

$$\begin{aligned} AE(10\%) &= \$400 + \left(\frac{\$100}{0.1}\right)(P/F, 10\%, 10)(0.10) \\ &= \$438.55 \end{aligned}$$

5.6. [Answer] (a)

Given: I = \$55,000, S = \$12,000, N = 5 years, O&M costs (a gradient series with $A1$ = \$18,000 and G = \$3000), i = 10%

Find: AE(10%)

$$\begin{aligned} AE(10\%)_{\text{ownership cost}} &= (\$55{,}000 - \$12{,}000)(A/P, 10\%, 5) + (0.10)(\$12{,}000) \\ &= \$12{,}543.29 \\ AE(10\%)_{\text{O\&M cost}} &= \$18{,}000 + \$3000(A/G, 10\%, 5) \\ &= \$23{,}430.30 \\ AE(10\%)_{\text{Total}} &= \$35{,}973.59 \end{aligned}$$

5.7. [Answer] (d)

Given: I = \$18,000, N = 10 years, S = \$3000, and MARR = 15%

Find: capital (ownership) cost

$$\begin{aligned} CR(10\%) &= (\$18,000 - \$3000)(A/P, 15\%, 10) + (0.20)\$3000 \\ &= \$3438.78 \end{aligned}$$

5.8. [Answer] (c)

Given: I = \$100K, S = 0, annual savings = \$30K (first year) and grow by 3% per year, N = 5 years, annual operating hours = 3000, i = 14%

Find: savings per hour

$$\begin{aligned} PW(14\%) &= -\$100,000 + \$30(P/A_1, 3\%, 14\%, 5) \\ &= -\$100,000 + \$30,000\left[\frac{1-(1+0.03)^5(1+0.14)^{-5}}{0.14-0.03}\right] \\ &= -\$100,000 + \$30,000\,[3.6174] \\ &= \$8520.73 \\ AE(14\%) &= \$8520.73(A/P, 14\%, 5) \\ &= \$2481.95 \\ \text{Savings per hour} &= \frac{\$2481.95}{3000} \\ &= \$0.83/\text{hour} \end{aligned}$$

5.9. [Answer] (d)

Given: I = \$50,000, S = \$5000, O&M = \$8000 per year, N = 12 years, and MARR = 8%

Find: required annual revenue to break even

Approach:

$$\begin{aligned} AE(8\%) &= (\$500,000 - \$5000)(A/P, 8\%, 12) + \$5000(0.08) \\ &\quad +\$8000 \\ &= \$14,371 \end{aligned}$$

5.10. [Answer] (d)

Given: P = \$100, F = \$337.50, N = 3 years

Find: i*

Approach: Use the (F/P, i, N) factor to establish equivalence between P and F.

$$\begin{aligned} \$100(F/P, i, 3) &= \$337.50 \\ \$100(1+i)^3 &= \$337.50 \\ i &= 50\% \end{aligned}$$

5.11. [Answer] (b)

Given: cash flow series, N = 3 years

Find: i*

Approach: Note that the project is a non-simple investment as there is more than one sign

change in the net cash flow series. This indicates the possibility of having multiple rates of return. In fact, there is a unique positive rate of return even though there are two rates of return—(38.61%, –61.93%).

The correct answer is (b).

5.12. [Answer] (c)

Given: cash flow series, $N = \infty$ years

Find: rate of return

Approach: Since we are dealing with an infinite cash flow stream, use the capitalized equivalent worth formula, which is A/i.

$$CE(i) = \frac{A}{i}$$

$$\$15,459 = \frac{\$3000}{i}$$

$$i = 19.41\%$$

5.13. [Answer] (c)

(a) Not accurate. IRR is not applicable to non-simple investment.

(b) Not accurate. The confusion comes from "total investment", because "Internal" rate of return cannot be total. Further, there could be other investment returns for the pool of spare fund.

(c) Yes.

(d) Not true. It won't be "higher"

5.14. [Answer] (a)

Given: I = \$150,000, S = 0, annual O&M costs = \$60,000, rate of return = 15%, N = 10 years

Find: required maximum investment to achieve a 15% rate of return

Approach: If the rate of return is known to be 15%, the total equivalent value of operating cash flows is

Equivalent net savings at $n = 0$:

$PW(15\%) = (\$60,000)(A/P, 15\%, 10) = \$301,120$

Scale of investment to break even = \$301,120

5.15. [Answer] (c)

Given: Cash flows, IRR = 10%

Find: X

$$PW(10\%) = -\$1500 + X(P/F, 10\%, 1) + \$650(P/F, 10\%, 2)$$
$$= X(P/F, 10\%, 3)$$
$$= 0$$
$$X = \$580$$

5.16. [Answer] (c)

Given: cash flow series, MARR = 10%, N = 4 years

Find: the incorrect statement

Approach: If the rate of return is known to be 10%, the net present value of the cash flow series at this rate of return should be zero.

$$FW(10\%) = -\$100(F/P, 10\%, 4) + \$20(F/P, 10\%, 3) + \$49(F/P, 10\%, 2)$$
$$+\$25(F/P, 10\%, 1) + \$33$$
$$\cong 0$$
$$PW(10\%) = AE(10\%) = 0$$

The incorrect statement is (c). The project's IRR is 10%.

5.17. [Answer] (d)

Given: project cash flows

Find: the correct statement

Approach: Apply the net investment test. If it fails to pass the net investment test, compute the RIC.

Two positive rates of return exist: 25% and 400%, respectively.

	0	1	2
Beg. Project Balance		–$3,200	$16,000
Interest Charged (25%)		–$800	$4,000
Cash Received	–$3,200	$20,000	–$20,000
Project Balance	–$3,200	$16,000	0

This is a mixed investment as PB(25%)1 > 0. At MARR = 30%, RIC = 44.23%.

5.18. [Answer] (d)

Given: cash flow series, rate of return = 15%, N = 3 years

Find: X

Approach: If the rate of return is known to be 15%, the net present value of the cash flow series at this rate of return should be zero.

$$0 = -\$50,000 + X(P/A, 15\%, 3) + \$10,000(P/F, 15\%, 3)$$
$$2.2832X = \$43,425$$
$$X = \$19,020$$

Chapter 6 - Comparing Mutually Exclusive Alternatives

6.1

Answer: (a)

Given: A = \$1000, N = 3, and MARR = 12%

Find: AE(12%)

Approach: The annual equivalent of a constant stream of cash flow series is \$1000, regardless of interest rate used. The answer is (a).

6.2 Answer: (b)

Given: cash flow series, N = 4, and MARR = 12%

Find: AE(12%)

$$\begin{aligned}\text{PW}(12\%)_{\text{B-A}} &= -\$3000 + \$2000(P/F, 12\%, 1)\\ &\quad +\$3000(P/F, 12\%, 2) + \$3000(P/F, 12\%, 3)\\ &\quad +\$1000(P/F, 12\%, 4)\\ &= \$3948\\ AE(12\%) &= \$3948(A/P, 12\%, 4)\\ &= \$1299\end{aligned}$$

6.3 Answer:

(a)

Given: cash flow series defined above, and MARR = 10%

Find: AE(10%)

$$\begin{aligned}AE(10\%) &= \$500 + \$500(F/A, 10\%, 10)(A/F, 10\%, 20)\\ &= \$500 + \$139.13\\ &= \$639.13\end{aligned}$$

6.4 Answer:

(d)

Given: cash flow series $= (A_2 = \$2000; A_4 = \$4000; A_6 = \$6000)$, and MARR = 10%

Find: AE(10%)

Approach:

$$\begin{aligned}AE(10\%) &= \$2000(P/F, 10\%, 2) + \$4000(P/F, 10\%, 4)\\ &\quad +\$6000(P/F, 10\%, 6)\\ &= (\$7771.78)(A/P, 10\%, 6)\\ &= \$1784.45\end{aligned}$$

6.5 Answer:

(b)

Given: $I = (\$5000, \$3000), S = (0, 0), N = (10, 5)$, and MARR = 10%

Find: Which option is cheaper and by how much?

Approach:

- Option 1: Oil-based painting (one-cycle):

$$AE(10\%) = \$5000(A/P, 10\%, 10) = \$813.73$$

- Option 2: Water-based painting (two-cycle):

$$AE(10\%) = \$3000(A/P, 10\%, 5) = \$791.39$$

Comments: Here we assume that, if we go with the water-based painting, we will need to repaint the house at the end of year 5. However, we only need to calculate the AE based on the first cycle. The annual difference is $22 in favour of the water-based painting option.

6.6 Answer:

(a)

Given: cash flows, MARR = 12%, required service period = 6 years

Find: the correct statement

Approach: Since both projects can be repeated with the same cash flows, we may need to find out how many replacements should be made for each option. Clearly, one replacement is required for Project A, while two more replacements are required for Project B. Then, calculate the net present value for each replacement option over six years.

- Project A with one future replacement:

$$\begin{aligned} PW(12\%)_{\text{A, first cycle}} &= -\$1000 - \$400(P/A, 12\%, 3) + \$200(P/F, 12\%, 3) \\ &= -\$1818.37 \\ PW(12\%)_{\text{A, over 6 years}} &= -\$1818.37[1 + (P/F, 12\%, 3)] \\ &= -3112.66 \end{aligned}$$

- Project B with two future replacements:

$$\begin{aligned} PW(12\%)_{\text{B, first cycle}} &= -\$8000 - \$200(P/A, 12\%, 2) \\ &= -\$1138.01 \\ PW(12\%)_{\text{B, over 6 years}} &= -\$1138.01[1 + (P/F, 12\%, 2) + (P/F, 12\%, 4)] \\ &= -\$2768.45 \end{aligned}$$

The correct answer is (a).

6.7 Answer:

(a)

Given: two cash flow series, $N = 2$ years

Find: the range of MARR where Project 2 is preferred

Approach: First create an incremental cash flow series on investment by subtracting Project 1 from Project 2. Then determine the rate of return on this incremental investment.

n	Cash Flows (2 – 1)
0	–$800
1	900
2	0

$IRR_{2-1} = 12.5\%$, indicating that Project 2 would be preferred over Project 1 when MARR $\leq 12.5\%$. The correct answer is (a).

6.8 Answer:

(d)

Given: financial facts

Find: the correct statement

Approach: Each project must be justified on its own merit. That is, the rate of return must exceed 20%. Since both projects fail to meet this requirement, the correct answer is (d).

6.9 Answer:

(c)

Given: two cash flow series with known IRRs, $N = 3$ years

Find: the correct statement

Approach: When we compare mutually exclusive investment projects based on the rate of return principle, we must apply the incremental analysis.

n	Project A	Project B	Project B – Project A
0	–$3000	–$5000	–$2000
1	1350	1350	0
2	1800	1800	0
3	1500	5406	$3906
IRR	25%	25%	25%

The correct answer is (c), as Project B would be preferred over Project A as long as the MARR is less than 25%.

6.10 Answer: (c)

Given: two mutually exclusive projects and its incremental cash flows

Find: the correct statement

Approach: Note that if the airport's MARR exceeds 5%, Vendor A is no longer a viable option. If MARR > 7%, both vendors are eliminated.

The correct statement is (c)

Chapter 7 – Cost Concepts Relevant to Decision Making

7.1 Answer: (b)

Problems 7.2 - 7.11: Definitional problem: Listed below are several terms related to cost terms and accounting information. (This problem is adapted from Managerial Accounting, R. H. Garrison and E. W. Noreen, 8th edition, Irwin, 1997, copyright © Richard D. Irwin, p. 68.)

- Period cost
- Variable cost
- Opportunity cost
- Fixed cost
- Marginal cost
- Product cost
- Prime cost
- Sunk cost
- Indirect cost
- Inventory cost
- Cost of goods sold

7.2 Answer: (b)

7.3 Answer: (b) or (c)

7.4 Answer: (a)

7.5 Answer: (b), (c) or (d)

7.6 Answer: (d)

7.7 Answer: (a), (b) or (d)

7.8 Answer: (c)

7.9 Answer: (d)

7.10 Answer: (a)

7.11 Answer: (d)

7.12 Answer: (c)

7.13 Answer: (c)

7.14 Answer: (b)

7.15 Answer: (c)

7.16 Answer: (c)

7.17 Answer: (b)

Fixed Cost	$60,000
V/C	0.3
MCR	0.7

Break-Even Point

$$\text{Break-Even Point} = \frac{\text{Fixed Cost}}{\text{MCR}}$$

Break-Even Point **85,714**

7.18 Answer: (c)

8% decrease in selling price on break-even point

V/Q	0.3
Q'	0.92
(V/Q)/Q'	0.326
MCR	0.674

$$\text{Break-Even Point} = \frac{\text{Fixed Cost}}{\text{MCR}}$$

Break-Even Point **89,032**

7.19 Answer: (a)

The fixed cost has no effect on the MCR because the MCR deals with only the variable cost.

7.20 Answer: (d)

10% decrease in variable cost on break-even point

V/Q	0.3
V'	1.1
(V/Q)*V'	0.330
MCR	0.670

$$\text{Break-Even Point} = \frac{\text{Fixed Cost}}{\text{MCR}}$$

Break-Even Point **89,552**

7.21 Answer: (b)

V/Q=0.3
(V/Q)*V'=0.3*1.03=0.309
Q'=1.15
(V'/Q)/Q'=0.309/1.15=0.2687
MCR=1-(V'/Q')=1-0.2687=0.7313

For book breakeven, the revenue = Fixed Cost / MCR
= $60,000/0.7313 = $82,046

The following is for student addition reference only:
For cash breakeven, the revenue = Fixed Cost exclude Depreciation / MCR

= $55,000/0.7313 = $75,209

The following answer is the Cash Breakeven without considering COGS increase.

Break even with $5000 depreciation expense

$$\text{Break-Even Point} = \frac{\text{Fixed Cost} - \text{Depreciation}}{\text{MCR}}$$

Break-Even Point	**78,571**

Chapter 8 – Depreciation

8.1 Answer:

(d)

Given: $I = \$45,000, S = \$5000, N = 4$ years, and SL depreciation

Find: B_2

$$D_1 = D_2 = \frac{(\$45,000 - \$5000)}{4} = \$10,000$$
$$B_2 = B_0 - D_1 - D_2 = \$45,000 - 2(\$10,000)$$
$$= \$45,000 - \$20,000 = \$25,000$$

8.2 Answer:

(b)

Given: $I = \$45,000, S = \$5000, N = 4$ years, and DB depreciation

Find: D_2

Step 1: Find the declining balance rate (α) to be used.

$$\alpha = 2\left(\frac{1}{4}\right) = 50\%$$

Step 2: Find the depreciation amount each year as follows:

$$D_1 = 0.5(\$45,000) = \$22,500$$
$$D_2 = 0.5(\$45,000 - D_1) = \$11,250$$

8.3 Answer:

(b)

Given: $I = \$45,000, S = \$10,000, N = 4$ years, and 200% DB depreciation

Find: B_3

$$\alpha = 2\left(\frac{1}{4}\right) = 50\%$$
$$D_1 = 0.5(\$45,000) = \$22,500$$
$$D_2 = 0.5(\$45,000 - D_1) = \$11,250$$
$$D_3 = 0.5(\$45,000 - D_1 - D_2) = \$5625$$
$$B_3 = B_2 - D_3 = 11,250 - \$5625 = \$5625 < S$$

Recalculated D_3 and B_3:

$$D_3 = \$1250$$
$$B_3 = \$10,000$$

8.4 Answer:

(b)

Given: $I = \$20,000, S = \$2000$, and $N = 200,000$ kilometres

Find: Depreciation rate

$$\text{depreciation rate} = \frac{\$20,000 - \$2000}{200,000 \text{ kilometres}} = \$0.09 \text{ per kilometre}$$

8.5

Answer:

(a)

Given: $I = \$170,000$, site preparation = \$30,000, market price = \$70,000 at end of year 4, and 25% CCA rate, and tax rate = 35%

Find: B_4, taxable gains, net proceeds

Depreciation base = \$170,000 + \$30,000 = \$200,000

$$B_4 = \$200,000(1-d/2)(1-d)^{n-1}$$
$$= \$200,000(1-0.25/2)(1-0.25)^{4-1}$$
$$= \$73,828$$

Taxable loss = \$73,828 - \$70,000 = \$3,828

Tax credit = 0.35 *\$3,828 = \$1,340

Net Proceeds = \$70,000 + \$1,340 =\$71,340

8.6 Answer:

(d)

Given: $I = \$200,000$, land = \$100,000, placed in service = January 2010, and class 4 property (CCA rate = 4%)

Find: D_1

$$D_1 = \$200,000(4\%)(50\%) = \$4000$$

8.7 Answer:

(b)

Given: I = \$200,000, trade-in value = \$21,000, $N = 5$ years $S = \$25,000$, book value for the traded asset = \$144,000, original price of the traded asset = \$180,000

Find: cost basis for the new asset

Book value for the traded-in asset = \$144,000

Implied salvage value = \$180,000 – \$144,000 = \$36,000

Unrecognized loss = \$36,000 – \$21,000 = \$15,000

New cost basis for the new asset = \$200,000 + \$15,000 = \$215,000

8.8 Answer:

(c)

Given: Accounting information as provided above

Find: net income in year 1

Tugboat Project	Tax Year 1
Operating revenue	\$200,000
Operating expenses	84,000
Depreciation	4,000
Taxable income	112,000
Income taxes (30%)	33,600
Net income	\$78,400

8.9 Answer:

(a)

Given: net income = $78,400 and depreciation = $4000

Find: net cash flow in year 1

$$\begin{aligned}\text{Net cash flow from operation} &= \text{net income} + \text{depreciation} \\ &= \$78,400 + \$4000 \\ &= \$82,400\end{aligned}$$

8.10 Answer: (c)

CCA_1= 50%*30%*$100,000=$15,000 UCC_1= $85,000
CCA_2=30% * $85,000=$25,500 UCC_2= $59,500
CCA_3=30% * $59,500=$17,850 UCC_3= $41,650
CCA_4=30% * $41,650=$12,495 UCC_4= $29,155
CCA_5=30% * $29,155=$8,746.5 UCC_5= $20,408.5

S= $20,000 < UCC_5= $20,408.5
Tax credit = 40% * 408.5 = $163.4

Assume $O\&M_5$=X
Method #1
Net Cash Flow = Net Income + Depreciation + Net Salvage Value
= Taxable Income – Tax + Depreciation + Net Salvage Value
= ($110,000 – X-$8,746.5)*(1-0.4) +$8,746.5 + $20,000 + $163.4
= $110,000*0.6-0.6X +$23,662
=$89,662-0.6X=$30,000

X= $99,437

Method #2

Net Cash Flow = Net Income + Depreciation + Net Salvage Value
= Taxable Income – Tax + Depreciation + Net Salvage Value
= ($110,000 – X)*(1-0.4) - $8,746.5*0.4 + $20,000 + $163.4
= $110,000*0.6-0.6X +$23,662
=$89,662-0.6X=$30,000

X= $99,437

Alternative approach:

Given: $I = \$100,000, S = \$20,000, N = 5$ years , CCA rate = 30%, annual revenue = \$110,000, net cash flow at year 5 = \$30,000, and income tax rate = 40%

Find: the operating and maintenance expenses in year 5

Book value in year 5 = \$20,408, so the disposal tax credit is $40\%(\$20,408 - \$20,000) = \$163$.

	Net Income
Revenue	\$110,000

	Net Income
Revenue	\$110,000
Salvage value	20,000
Disposal Credit	163
Expenses:	
O & M	X
Depreciation	\$8,747
Taxable income	$\$101,253 - X$
Income taxes	$\$40,501 - 0.4X$
Net income	$\$60,752 - 0.6X$
Net cash flow	\$30,000

Note that the net cash flow is obtained by adding the non-cash expenses (depreciation) to net income:

$\$30,000 = \$60,752 - 0.6X +$ Depreciation ($\$8747 - \$163$)

$X = \$99,437$

Chapter 9 – Corporate Income Taxes

9.1 Answer:

(d)

Combined lower tax rate = 11% + 2.5% = 13.5%

Combined higher tax rate = 16.5% + 10% = 26.5%

Taxes = \$400,000 * 13.5% + (\$2,000,000 – \$400,000) * 26.5% = \$478,000

After-tax income = \$2,000,000 – \$478,000 = \$1,522,000

9.2 Answer:

(b)

$$UCC_{10} = \$75,000(1 - 30\% / 2)(1 - 30\%)^{10-1} = \$2573$$

Gain in sale = \$10,000 – \$2573 = \$7427

Disposal tax = 40% * \$7427 = \$2971

9.3 Answer:

(b)

Federal Taxes are the same in both provinces.

PEI Taxes = 1% * \$400,000 + 16% * (\$600,000 – \$400,000) = \$36,000

NB Taxes = 5% * \$400,000 + 11% * (\$600,000 – \$400,000) = \$42,000

9.4 Answer:

(b)

Federal Taxes are the same in both provinces.

PEI Taxes = 1% * \$400,000 + 16% * (\$1,000,000 – \$400,000) = \$100,000

NB Taxes = 5% * \$400,000 + 11% * (\$1,000,000 – \$400,000) = \$86,000

\$100,000 – \$86,000 = \$14,000

9.5 Answer:

(c)

Federal Taxes are the same in both provinces.

PEI Taxes = 1% * \$400,000 + 16% * (X – \$400,000)

NB Taxes = 5% * \$400,000 + 11% * (X – \$400,000)

\$4000 – \$64,000 + 0.16X = \$20,000 – \$44,000 + 0.11X

0.05X = \$36,000

X = \$720,000

9.6 Answer:

(d)

Taxable income = \$450,000 – \$300,000 * 30%(1 – 30%/2)(1 – 30%)$^{3-2}$ = \$396,450

Taxable income is < \$400,000, so we only use the lower rate.

Lower rate taxes: \$396,450 * 15.5% = \$61,450

Net income = \$335,000

9.7 Answer:

(b)

Taxable income = \$550,000 – \$300,000 * 30%(1 – 30%/2)(1 – 30%)$^{5-2}$ – \$200,000 * 40%(1 – 40%/2)(1 – 40%)$^{2-2}$

Taxable income = \$459,761

Lower rate taxes: \$400,000 * 15.5% = \$62,000

Higher rate taxes: (\$459,761 – \$400,000) * 28.5% = \$17,032

Average tax rate = (\$62,000 + \$17,032)/\$459,761 = 17.19%

9.8 Answer:

(c)

UCC(Machine) = \$300,000 * (1 – 30%/2)(1 – 30%)$^{10-1}$ = \$10,290

Gains on Machine = \$10,000 – \$10,290 = –\$290

UCC(Trucks) = \$200,000 * (1 – 40%/2)(1 – 40%)$^{7-1}$ = \$7465

Gains on Trucks = \$15,000 – \$7465 = \$7535

Total Gains = \$7535 – \$290 = \$7245

Tax Effect = \$7245 * 28.5% = \$2065

Chapter 10 – Developing Project Cash Flows

10.1 **Answer:** (b)

Given: accounting and financial data
Find: project cash flow at the end of year 10
Approach: Use a tabular approach.

	Year 10
Income Statement	
Revenue	$150,000
Expenses:	
O&M cost	$50,000
Depreciation	$1,470
Taxable income	$98,530
Income taxes (40%)	$39,412
Net income	$59,118
Cash Flow Statement	
Cash flow from operation:	
Net income	$59,118
Depreciation	$1,470
Cash flow from investing:	
Investment	
Salvage value	$15,000
Gains taxes	(4,628)
Working capital recovery	+2,000
Net cash flow	$72,960

10.2 **Answer:** (d)

Given: accounting and financial data, with debt financing
Find: project cash flow at the end of year 10
Approach: Use a tabular approach. There will be entries related to financing activities.

	Year 10
Income Statement	
Revenue	$150,000
Expenses:	
O&M cost	$50,000
Depreciation	$1,470
Debt interest	$1,480
Taxable income	$97,050
Income taxes (40%)	$38,820
Net income	$58,230
Cash Flow Statement	
Cash flow from operation:	
Net income	$98,230
Depreciation	$1,470
Cash flow from investing:	
Investment	
Salvage value	$15,000
Gains taxes	(4,628)
Working capital recovery	+2,000
Cash flow from financing:	
Principal repayment	($14,795)
Net cash flow	$57,277

10.3 **Answer:** (a)

Given: I = \$150,000, S = 20,000, O&M = \$52,500 per year, MARR = 12%, tax rate = 40%, CCA rate = 25%

Find: net present worth

Approach: Create a cash flow statement using Excel

CCA Rate =	25%											
Year	0	1	2	3	4	5	6	7	8	9	10	11	12
Income Statement													
Revenues		$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00	$52,500.00
Expenses:													
O&M cost													
Depreciation (25%)		$18,750.00	$32,812.50	$24,609.38	$18,457.03	$13,842.77	$10,382.08	$7,786.56	$5,839.92	$4,379.94	$3,284.96	$2,463.72	$1,847.79
Debt interest													
Taxable Income		$33,750.00	$19,687.50	$27,890.63	$34,042.97	$38,657.23	$42,117.92	$44,713.44	$46,660.08	$48,120.06	$49,215.04	$50,036.28	$50,652.21
Income Taxes (40%)		$13,500.00	$7,875.00	$11,156.25	$13,617.19	$15,462.89	$16,847.17	$17,885.38	$18,664.03	$19,248.02	$19,686.02	$20,014.51	$20,260.89
Net Income		$20,250.00	$11,812.50	$16,734.38	$20,425.78	$23,194.34	$25,270.75	$26,828.06	$27,996.05	$28,872.04	$29,529.03	$30,021.77	$30,391.33
Cash Flow Statement													
Operating Activities:													
Net Income		$20,250.00	$11,812.50	$16,734.38	$20,425.78	$23,194.34	$25,270.75	$26,828.06	$27,996.05	$28,872.04	$29,529.03	$30,021.77	$30,391.33
Depreciation		$18,750.00	$32,812.50	$24,609.38	$18,457.03	$13,842.77	$10,382.08	$7,786.56	$5,839.92	$4,379.94	$3,284.96	$2,463.72	$1,847.79
Investment Activities:													
Investment	-$150,000.00												
Working Capital													
Salvage													$20,000.00
Gains Tax													-$5,782.66
Financing Activities:													
Borrowed funds													
Principal repayment													
Net Cash Flow	-$150,000.00	$39,000.00	$44,625.00	$41,343.75	$38,882.81	$37,037.11	$35,652.83	$34,614.62	$33,835.97	$33,251.98	$32,813.98	$32,485.49	$46,456.46
NPV	$86,756.20												

10.4 **Answer:** (b)

Given: I = \$120,000, S = 0, O&M = \$20,000 per year, N = 4 years, MARR = 14%

Find: required annual savings (X)

Approach: Set up a present-worth equation as a function of X

$$PW(14\%) = -\$120,000 + (X - 20,000)(P/A, 14\%, 4)$$

$$= -\$120,000 + 2.9137X - \$58,274 = 0$$

$$2.9137X = \$178,274$$

$$X = \$61,184$$

10.5 Answer: (c)

Given: financial data, MARR = 15%, t_m = 40%

Find: net present value of the project

Approach: Obtain the after-tax cash flow series using the income statement approach.

Saving	$200,000		O&M	$80,000	per year		
Tax rate	40%		Depreciation	$30,000	per year		
MARR	15%						
Year	0	1	2	3	4	5	Total
Income Statement							
Revenue		$200,000	$200,000	$200,000	$200,000	$200,000	
Expenses:							
O&M		$80,000	$80,000	$80,000	$80,000	$80,000	
Depreciation		$30,000	$30,000	$30,000	$30,000	$30,000	$150,000
Taxable Income		$90,000	$90,000	$90,000	$90,000	$90,000	
Income Tax		$ 36,000	$36,000	$36,000	$36,000	$36,000	
Net Income		$54,000	$54,000	$54,000	$54,000	$54,000	
Cash Flow Statement							
Operation activities							
Net Income		$ 54,000	$54,000	$54,000	$54,000	$54,000	
Depreciation		$30,000	$30,000	$30,000	$30,000	$30,000	
Investment Activities							
Investment	$ (150,000)						
Salvage Value						$25,000	
UCC (Book value)						$ -	
Loss (Gain)						$(25,000)	
Loss Tax Credit (Tax to be paid)						$ (10,000)	
Net Cash Flow	$ (150,000)	$84,000	$84,000	$84,000	$84,000	$99,000	
PW (@MARR)	$139,039						

10.6 **Answer:** (c)

Given: I = \$20,000, S = \$5000, O&M = \$4000 per year, annual revenue = \$15,000, CCA rate = 30%, MARR = 12%, and tax rate = 40%

Find: rate of return

Approach: Create a cash flow statement using Excel.

CCA Rate =	30%						
Year	0	1	2	3	4	5	6
Income Statement							
Revenues		$15,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00	$15,000.00
Expenses:							
O&M cost		$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00	$4,000.00
Depreciation (30%)		$3,000.00	$5,100.00	$3,570.00	$2,499.00	$1,749.30	$1,224.51
Debt interest							
Taxable Income		$8,000.00	$5,900.00	$7,430.00	$8,501.00	$9,250.70	$9,775.49
Income Taxes (40%)		$3,200.00	$2,360.00	$2,972.00	$3,400.40	$3,700.28	$3,910.20
Net Income		$4,800.00	$3,540.00	$4,458.00	$5,100.60	$5,550.42	$5,865.29
Cash Flow Statement							
Operating Activities:							
Net Income		$4,800.00	$3,540.00	$4,458.00	$5,100.60	$5,550.42	$5,865.29
Depreciation		$3,000.00	$5,100.00	$3,570.00	$2,499.00	$1,749.30	$1,224.51
Investment Activities:							
Investment	-$20,000.00						
Working Capital							
Salvage							$5,000.00
Gains Tax							-$857.12
Financing Activities:							
Borrowed funds							
Principal repayment							
Net Cash Flow	-$20,000.00	$7,800.00	$8,640.00	$8,028.00	$7,599.60	$7,299.72	$11,232.68
IRR	34%						
NPV	$14,228.78						

10.7 **Answer:** (c)

Given: I = \$12,000, S = \$3000, O&M = \$2500 per year, annual revenue = \$12,500, CCA rate = 30%, MARR = 12%, tax rate = 40%

Find: net present worth

Approach: Create a cash flow statement using Excel. Assume that an identical asset like Machine B will be available at the end of three years for replacement.

CCA Rate =	30%						
Year	0	1	2	3	4	5	6
Income Statement							
Revenues		$12,500.00	$12,500.00	$12,500.00	$12,500.00	$12,500.00	$12,500.00
Expenses:							
O&M cost		$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00	$2,500.00
Depreciation (30%)		$1,800.00	$3,060.00	$2,142.00	$1,800.00	$3,060.00	$2,142.00
Debt interest							
Taxable Income		$8,200.00	$6,940.00	$7,858.00	$8,200.00	$6,940.00	$7,858.00
Income Taxes (40%)		$3,280.00	$2,776.00	$3,143.20	$3,280.00	$2,776.00	$3,143.20
Net Income		$4,920.00	$4,164.00	$4,714.80	$4,920.00	$4,164.00	$4,714.80
Cash Flow Statement							
Operating Activities:							
Net Income		$4,920.00	$4,164.00	$4,714.80	$4,920.00	$4,164.00	$4,714.80
Depreciation		$1,800.00	$3,060.00	$2,142.00	$1,800.00	$3,060.00	$2,142.00
Investment Activities:							
Investment	-$12,000.00			-$12,000.00			
Working Capital							
Salvage				$3,000.00			$3,000.00
Gains Tax				$799.20			$799.20
Financing Activities:							
Borrowed funds							
Principal repayment							
Net Cash Flow	-$12,000.00	$6,720.00	$7,224.00	-$1,344.00	$6,720.00	$7,224.00	$10,656.00
IRR	42%						
NPV	$12,570.73						

10.8 **Answer:** (a)