

**ELEC 481**

**Assignment 2**

Submitted to Prof. Jeff Carmichael

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Jian Gao

**Problem 1 (4-29)****a)**

Remaining amount:  $\$500,000 - \$100,000 = \$400,000$

Monthly interest rate =  $0.09/12 = 0.75\%$

Monthly payment =  $\$400,000 (A/P, 0.75\%, 360) = \$400,000 * 0.008046 = \$3218.5$

**b)**

$P = A (P/A, i, n) = \$3218.5 * 111.145 = \$357,720$

**Problem 2 (4-41)**

$F = \$200 (F/A, 7\%, 15) = \$200 * 25.13 = \$5025.8$

At the end of the 15<sup>th</sup> year:  $F' = 1.07 * \$5025.8 = \$5377.61$

**Problem 3 (4-52)**

Option 1:

$NPW = A (P/A, 12\%, 4) = 3.04 A$

Option 2:

$NPW = 150 (P/F, 12\%, 1) + 300 (P/F, 12\%, 2) + 450 (P/F, 12\%, 3) + 600 (P/F, 12\%, 4) + 750 (P/F, 12\%, 5)$   
 $= \$1500.27$

Thus, we can calculate that  $A = \$493.51$

**Problem 4 (4-85)****a)**

Nominal annual interest rate =  $1.25\% * 12 = 15\%$

**b)**

Effective annual interest rate =  $1.0125^{12} - 1 = 16.08\%$

**c)**

Monthly Payment =  $\$10,000 (A/P, 1.25\%, 48) = \$10,000 * 0.0278 = \$278$

**Problem 5 (5-37)**

If he purchases the \$300 muffler, he is likely to spend another \$300 in 2 years.

Thus, for the second payment:  $P = \$300 (P/F, 20\%, 2) = \frac{\$300}{1.2^2} = \$208.33$

Meanwhile, the additional cost of buying a \$400 muffler is just \$100.

Therefore \$400 muffler is the better option.

## **Problem 6 (5-55)**

**a)**

Infinite Analysis Period:

$$\text{Full tunnel: Present cost} = \$556,000 + \$40,000 (A/F, 7\%, 10)/0.07 = \$597,358$$

$$\text{2 half tunnels: Present cost} = \text{Cost of the first half tunnel} * [1 + (P/F, 7\%, 20)]$$

$$\text{Cost of the first} = \$402,000 + [\$32,000 (A/F, 7\%, 10)/0.07] + \$2000/0.07 = \$463,658$$

$$\text{Present cost} = \$583,476$$

The plan of building 2 half tunnels should be chosen.

**b)**

A period of 40 years:

$$\begin{aligned} \text{Full tunnel: Present cost} &= \$556,000 + \$40,000 [(P/F, 7\%, 10) + (P/F, 7\%, 20) \\ &\quad + (P/F, 7\%, 30) + (P/F, 7\%, 40)] = \$597,180 \end{aligned}$$

$$\begin{aligned} \text{2 half tunnels: Cost of the first half tunnel} &= \$402,000 + \$32,000 [(P/F, 7\%, 10) + (P/F, 7\%, 20) \\ &\quad + (P/F, 7\%, 30) + (P/F, 7\%, 40)] + \$2,000 (P/A, 7\%, 40) \\ &= \$461,607 \end{aligned}$$

$$\begin{aligned} \text{Cost of the second half tunnel} &= \$402,000 + \$32,000 [(P/F, 7\%, 10) + (P/F, 7\%, 20) \\ &\quad + \$2,000 (P/A, 7\%, 20) \\ &= \$115,700 \end{aligned}$$

$$\text{Present total cost} = \$577,307$$

The plan of building 2 half tunnels should be chosen.

## **Problem 7 (5-70)**

**a)**

8% interest:

$$\text{Alternative 1: } \$135 (P/A, 8\%, 10) - \$500 - \$500 (P/F, 8\%, 5) = \$65.55$$

$$\text{Alternative 2: } \$100 (P/A, 8\%, 10) - \$600 - \$350 (P/F, 8\%, 5) + \$250 (P/F, 8\%, 10) = -\$51.40$$

$$\text{Alternative 3: } \$100 (P/A, 8\%, 10) - \$700 + \$180 (P/F, 8\%, 10) = \$54.38$$

$$\text{Alternative 4: } \$0$$

Thus, alternative 1 should be chosen.

**b)**

12% interest:

$$\text{Alternative 1: } \$135 (P/A, 10\%, 10) - \$500 - \$500 (P/F, 10\%, 5) = -\$20.93$$

$$\text{Alternative 2: } \$100 (P/A, 10\%, 10) - \$600 - \$350 (P/F, 10\%, 5) + \$250 (P/F, 10\%, 10) = -\$153.08$$

$$\text{Alternative 3: } \$100 (P/A, 10\%, 10) - \$700 + \$180 (P/F, 10\%, 10) = -\$77.02$$

$$\text{Alternative 4: } \$0$$

Thus, alternative 4 should be chosen.

**Problem 8 (5-124)**

Natural gas:

Net present cost:  $\$30,000 + \$7,500 (P/A, 8\%, 20) + \text{present cost of fuel oil only}$   
 $= \$103,636.11 + \text{present cost of fuel oil only}$

Fuel oil:

Net present cost:  $\$55,000 + \text{present cost of fuel oil only}$

Coal:

Net present cost:  $\$180,000 - \$15,000 (P/A, 8\%, 20) + \text{present cost of fuel oil only}$   
 $= \$32,727.79 + \text{present cost of fuel oil only}$

Thus, in comparison, coal is the best option.