ELEC 481 Homework 2

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Question 1.

$$800 \cdot 1.032^{15} + 800 \cdot 1.032^{14} + \ldots + 800 \cdot 1.032 = 800 \cdot 1.032 \cdot \frac{1 - 1.032^{15}}{1 - 1.032} = \$15,582.$$

Question 2. I assume the money comes at the end of the period. Value of the second option in today's dollars:

$$250 \cdot 1.04^4 + 500 \cdot 1.04^3 + 750 \cdot 1.04^2 + 1000 \cdot 1.04 + 1250 = \$3956.10.$$

For this to be equal:

$$A = 3956.1 \left(\frac{1.04}{1.04^5 - 1.04} \right) = \$896.$$

Question 3a.

$$r = 0.55 \cdot 12 = 6.6\%.$$

Question 3b.

$$m = 1.055 \cdot 12 = \left(1 + \frac{r}{m} \right)^{12} - 1 = 6.8\%.$$

Question 3c.

$$A = F \left(\frac{i(1+i)^n}{(1+i)^n - 1} \right) = 42000 \cdot \left(\frac{0.0055 \cdot 1.0055^{48}}{1.0055^{48} - 1} \right) = \$998.$$

Question 4. Compare the total cost in today's dollars:

$$C_1 = 440 + \frac{440}{1.06^2} = \$831.60.$$

$$C_2 = \$750.$$

Thus buying the more expensive muffler would be better and would save him \$81.60.
Question 5a. Net benefit:

$$B_1 = 135 \left(\frac{1.08^{10} - 1}{0.08 \cdot 1.08^{10}} \right) - 500 - \frac{500}{1.08^5} = \$65.57.$$

$$B_2 = 100 \left(\frac{1.08^{10} - 1}{0.08 \cdot 1.08^{10}} \right) - 600 - \frac{600}{1.08^5} + \frac{250}{1.08^5} + \frac{250}{1.08^{10}} = -\$51.4.$$

$$B_3 = 100 \left(\frac{1.08^{10} - 1}{0.08 \cdot 1.08^{10}} \right) - 700 + \frac{180}{1.08^{10}} = \$54.38.$$

$$B_4 = \$0.$$

Therefore option 3 has the highest net benefit.

Question 5b. Net benefit:

$$B_1 = 135 \left(\frac{1.12^{10} - 1}{0.12 \cdot 1.12^{10}} \right) - 500 - \frac{500}{1.12^5} = -\$20.93.$$

$$B_2 = 100 \left(\frac{1.12^{10} - 1}{0.12 \cdot 1.12^{10}} \right) - 600 - \frac{600}{1.12^5} + \frac{250}{1.12^5} + \frac{250}{1.12^{10}} = -\$153.08.$$

$$B_3 = 100 \left(\frac{1.12^{10} - 1}{0.12 \cdot 1.12^{10}} \right) - 700 + \frac{180}{1.12^{10}} = -\$77.02.$$

$$B_4 = \$0.$$

Therefore option 4 has the highest net benefit.

Question 6. Net relative cost (ignoring cost constant for all of them):

$$C_{ng} = 40000 + 5500 \left(\frac{1.06^{20} - 1}{0.06 \cdot 1.06^{20}} \right) = \$103085.$$

$$C_{coal} = 240000 - 15000 \left(\frac{1.06^{20} - 1}{0.06 \cdot 1.06^{20}} \right) = \$67951.$$

$$C_{oil} = \$75000.$$

Therefore coal is the most economical