ELEC 481

Assignment 1

Submitted to Prof. Jeff Carmichael

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Problem 1

a)

Average cost = 0
Marginal cost = 0

b)

Average cost = $\frac{75*25}{125}$ = $ 15
Marginal cost = $ 75

c)

Average cost = $\frac{75*150}{250}$ = $ 45
Marginal cost = $ 75

Problem 2

a)

Book cost = $ 7000

b)

Opportunity cost = $ 4000

c)

$ 6000 – ($ 4000 + $ 500) = $ 1500 cheaper than buying a new brass pump

Problem 3

a)

Usage charge = $50 * 0.126 + 50 * 0.106 + 150 * 0.06 + 2550 * 0.057$ = $ 165.95
Demand charge = $(70 - 35) * 4.18$ = $ 146.3
Total = $ 312.25

Average usage charge = $\frac{165.95}{2800}$ = 5.93 cents/kWh
Marginal usage charge = 5.7 cents/kWh

b)

Monthly bill increases by: $1200 * 0.057$ = $ 68.4
Marginal usage charge = 5.7 cents/kWh

c)

Monthly bill increases by: $100 * 0.057 + 45 * 4.18 + 5 * 8.02$ = $ 233.9

Problem 4

Cost of the new reactor: $\left(\frac{4.5}{1.5}\right)^{0.75} * 40000$ = $ 91,180.28

Cost in today's dollars: $91180.28 * \left(\frac{300}{120}\right)$ = $ 227,950.7

Problem 5

Time value of money suggests the idea that receiving money now is better than receiving the same amount a certain amount of time later because of the interest the present money could have.
Take student loans for example: certain student loans subsidized by the government offer students funds at the beginning of school with zero interest rate. The students only need to pay off the exact amount they received eventually.

Problem 6

a)

Present worth: $\frac{20000}{(1+0.07)^5}$ = $ 14,259.72

b)

Present worth: $\frac{20000}{(1+0.07)^{10}}$ = $ 10,166.99

c)

Present worth: $\frac{20000}{(1+0.07)^{20}}$ = $ 5,168.38

d)

Present worth: $\frac{20000}{(1+0.07)^{50}}$ = $ 678.96

Problem 7

Nominal interest rate: $\left(\frac{85}{75} - 1\right) * 2$ = 26.66%

Effective annual interest rate: $1.1333^2 - 1$ = 28.44%