ME 1065 – HW 6 Solutions

1.

$i = 8\%$ $m = 12$ (monthly) $n = 30$ (years) $R = \$500$

$PW = ?$ (+ \$7000 down payment)

$$PW = R\left(\frac{P}{a}, \frac{i}{m}, mn\right) = 500\left[\frac{\left(1+\frac{.08}{12}\right)^{12\cdot 30} - 1}{\left(\frac{.08}{12}\right)\left(1+\frac{.08}{12}\right)^{12\cdot 30}}\right]$$

$PW = \$68,141.75$

so House Price = $\$68,141 + \$7000 = \boxed{\$75,141.75}$

2.

(A) \$5000, 5 years
(B) \$10,000, 10 years

$i = 9\%$, Total Life = 40 years, $PW = ?$

(A) $PW = [5000(\frac{A}{P}, 9\%, 5)][\frac{P}{A}, 9\%, 40]$

Finds Annual cost of lining — PW of annual costs over 40 years

$PW = 5000(0.2571)(10.757) = \boxed{\$13,828}$

(B) $PW = [10,000(\frac{A}{P}, 9\frac{3}{4}\%, 10)][\frac{P}{A}, 9\%, 40]$

$PW = 10,000(0.1558)(10.757) = \boxed{\$16,762}$

So recommend 5-year lining

3.

For each option, where $L = 795,000$ m

$$PW = \text{Initial Cost} \times L + \text{Installation Cost} + \frac{P}{a} \times O\&M \times \frac{L}{10,000} - SV \times \frac{P}{F}$$

Note, though, that each option has a different life-span, so we must look at the PW over 210 years if we want to use this method.

A better way is to compare the annualized cost of each option.

For the iron pipe:

$$\text{Annual Cost} = \left(\frac{\$60}{10{,}000\,m}\right)(795{,}000\,m) + \left[\$105{,}000 + \frac{\$3}{m}\,795000\,m\right]\left(\frac{a}{P}, 0.08, 7\right)$$

$$- [0.2 \times 3 \times 795{,}000]\left(\frac{a}{F}, 0.08, 7\right)$$

$$= \$428{,}776.74$$

For the iron-alloy: $= \$556{,}341.87$

For the chrome-iron: $= \$536{,}793.65$

So the Iron-pipe is the best alternative

	Years	O&M	Initial	Salvage	a/p	a/f	Total Annualized
Iron	7	3975	2490000	477000	0.192072	0.112072	$428,776.74
Iron Alloy	10	3180	4080000	795000	0.149029	0.069029	$556,341.87
Chrome-Iron	15	2385	4875000	954000	0.11683	0.03683	$536,793.65

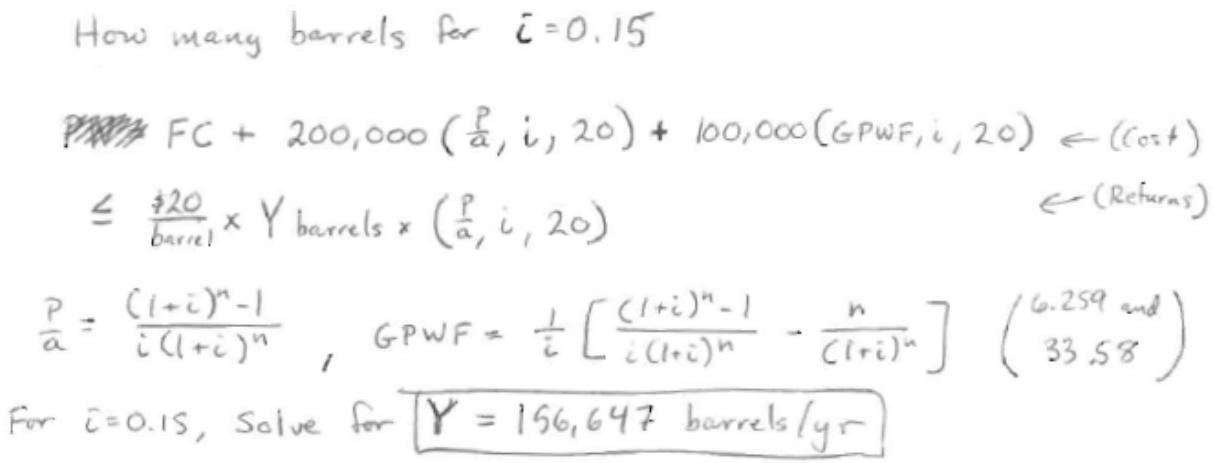
4.

FC = \$15,000,000

n = 20

O+M = \$200,000 + \$100,000 each yr after yr. 1

Price of oil = \$20/barrel



5. There are lots of possible answers to this.

6. (a) In Pittsburgh/Allegheny County, 5% of houses have an elevated risk of lead poisoning; In Houston/Harris County, 1% of houses have an elevated risk of lead poisoning. Pittsburgh has a higher risk, possibly because it has a greater number of older homes, which were built when lead was still a common building material.

(b) Pittsburgh/Allegheny County ranks among the cleanest 20% of all counties in the U.S. for Superfund sites; Houston/Harris County ranks among the dirtier 30% of all counties in the U.S. for Superfund sites. Houston is clearly worse in terms of Superfund sites. This is probably because of the large presence of industries connected to petroleum extraction and processing.