

IE 342 2019-2020 Fall

Study Set 3

Please do not submit your answers as they will not be graded!!
(Solutions will not be provided)

- 1) Consider the three projects whose cash flows are stated in the table below. What is the value of the investment at the end of the fourth year under MARR = 12%?

Project's Cash Flow (in \$)			
Year	A	B	C
0	-1,000	-5,700	-8,300
1	-300	3,500	1,200
2	900	-2,000	-600
3	2,450	6,000	0
4	3,200	5,400	4,400
5	-3,000	-1,750	100

Answer: Project A=\$2,399.39 Project B=\$3,996.88 Project C=-\$7,637.65

- 2) China has constructed the biggest amusement park in the world for \$500,000,000 and it has a useful life of 30 years. Operating cost of the amusement park for each year is \$250,000 and the salvage value at the end of 30th year is \$50,000,000. In the first year they had revenue of \$48,000,000 and revenue increases %5 each year. If MARR=10%.

- Find AE(10%).
- Suppose that 10,000,000 people visit the amusement park, what is the profit obtained per visitor?

Answer: a) \$23,631,799.48 b) 2.363

- 3) A third wave coffee shop considers replacing their old coffee machine with a new one due to its high maintenance costs. The new coffee machine costs \$30,000 including the installation cost and it will require maintenance and repair every 2 years at a cost of \$6,000. In addition, an expenditure of \$8,000 will need to be made at the end of the third year for a caffeine extraction mechanism for the customers who prefer decaf coffee which will not be available until then. Annual operating costs are expected to be \$1,000 for the first 5 years and \$1,500 thereafter. Compute the capitalized equivalent assuming $i=5\%$.

Answer: -\$123,280.9

- 4) Three types of drill bits can be used in a certain manufacturing operation. A bright high-speed steel (HSS) bit is the least expensive to buy, but it has a shorter life than either gold oxide or titanium nitride bits. The HSS bits will cost \$3500 to buy and will last for 3 months under the conditions in which they will be used. The operating cost for these bits will be \$2000 per month. The gold oxide bits will cost \$6500 to buy and will last for 6 months with an operating cost of \$1500 per month. The titanium nitride bits will cost \$7000 to buy and will last 6 months with an operating cost of \$1200 per month. At an interest rate of 12% per year, compounded monthly, which type of drill bit should be used based on a future worth analysis?

Answer: Titanium nitride bits. (\$-14,813)

- 5) The machines shown below are under consideration for an improvement to an automated candy bar wrapping process. Determine which should be selected based on an annual worth analysis using an interest rate of 15% per year.

	Machine C	Machine D
First cost, \$	-40,000	-65,000
Annual cost, \$/year	-10,000	-12,000
Salvage value, \$	12,000	25,000
Life, years	3	6

Answer: Machine C. (\$-24,063)

- 6) Compare the alternatives shown below based on their present worth, using an interest rate 12% per year, compounded quarterly.

	Alternative E	Alternative F	Alternative G
First cost, \$	-200,000	-300,000	-900,000
Quarterly income, \$/quarter	40,000	50,000	40,000
Salvage value, \$	60,000	70,000	100,000
Life, years	2	4	∞

Answer: Select alternative E.

- 7) A newly constructed aquarium costs \$15,000,000. The same aquarium is estimated to need renovation every 15 years at a cost of \$3,000,000. Annual repairs and maintenance are estimated to be \$1,000,000 a year.
- a) If the interest rate is 5%, determine the capitalized cost of aquarium.
 - b) Suppose that in part a, the aquarium must be renovated every 20 years, not every 15 years. What is the capitalized cost of the aquarium?
 - c) Repeat part a and part b with an interest rate of 10%. What can you say about the effect of interest on the results?

Answer: a) \$37,780,537.26 b) \$36,814,555.23 c) \$25,523,788.74

- 8) There are two types of machines for a manufacturing process. Machine A has a first cost of \$75,200 and its salvage value at the end of six years is \$21,000. The operating cost of machine A is estimated to be \$68,000 per year. Extra income taxes are estimated at \$2,400 per year. Machine B has a first cost of \$44,000 and its salvage value at the end of six years is negligible. The annual operating cost will be \$11,500 per year. Compare these two alternatives by present worth method at $i=13\%$.

Answer: Choose machine B

- 9) A production facility is planning to buy an enterprise resource planning software (ERP). The implementation and training costs will result a total of \$120,000 at the end of first year. Following year it will generate a profit of \$45,000, and continuing \$50,000, \$55,000, \$60,000 respectively. If $MARR=15\%$, what is the net worth of this 5 year project at the end of the 5th year?

Answer: \$47,933.63