Name_____ E-mail_____

EM 600 Engineering Economics and Cost Analysis, **Final Examination**
Due xx/xx/18 by 3pm
School of Systems & Enterprises, Stevens Institute of Technology

"I PLEDGE MY HONOR THAT I HAVE ABIDED BY THE STEVENS HONOR SYSTEM"

By: _____

Question 1:
LECTURE 8

a. A country in South America has experienced inflation for the past 2 years as follows: the first year's periodic inflation rate is 8%, and the second year's periodic inflation rate is 11%. Calculate the average inflation rate for a 2-year period. **[2 points]**

b. Assume that the expected inflation rate for this year is 9%. If the current inflation free interest rate is 10%, what ought the market interest rate to be? **[2 points]**

c. A series of five constant dollar (or real-dollar) payments, beginning with $12,000 at the end of the first year, are increasing at the rate of 6% per year. Assume that the average general inflation rate is 3%, and the market interest rate is 9% during this inflationary period. What is the equivalent present worth of the series? **[6 points]**

Question 2:
LECTURE 8

Dixie Cups Inc. is considering purchasing a computer to control plant packaging for a spectrum of various products. The financial data is as follows:

- Investment: $280,000
  - 50% debt equity ratio. Loan ($140,000) borrowed at 11% interest.
- Project life: 6 years
- Salvage value: $40,000
  - **Year 0 dollars**
- Depreciation method: 5-year MACRS
- Income tax rate: 40%
- Annual Revenue: $225,000
  - **Year 0 dollars**
- Annual Expense: $110,000
  - **Year 0 dollars**
  - Does NOT include depreciation
  - Does NOT include interest
- Market interest rate (i): 14%

If the general inflation rate (effects revenues, expenses, salvage value) during the next 6 years is expected to increase by 5% annually:

a. Develop the income statement for the project. **[3 points]**

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b. Develop the cash flow statement for the project. **[3 points]**
(Hint: Don't forget the Financing Activities)

c. Determine the PW of the project. Is the project economically viable? Why? **[4 points]**
(Hint: Cash flows in Actual dollars, given market interest rate. Therefore, no need to convert to constant dollars before calculating PW)

Question 3:
LECTURE 9

Mark one correct answer for each of the following questions.
Please place a mark in the **O** symbol to indicate which is the correct answer.
There is ONLY one correct answer for each question.
Each question (a, b, c, d & e) is worth: [2 points]
Total marks for question 3: [10 points]

a. The remaining useful life of an asset that results in the minimum annual equivalent cost is known as the:

- **O** Useful Life
- **O** Economic Service Life
- **O** Economic Salvage Life
- **O** Operating Life

b. Which of the following statements is incorrect in relation to Sunk Costs:

- **O** Any past cost that is unaffected by any future investment decision.
- **O** Costs that have already been incurred and which cannot be recovered to any significant degree.
- **O** Should be considered when making economic decisions.
- **O** Economic decisions should be based on the best possible future results.

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c. True or False:

Different operating costs must be included for both the defender and the challenger

- O True
- O False

d. True or False:

The current market value and the trade-in allowance typically differ?

- O True
- O False

e. Which of the following statements is incorrect in relation the guidelines for Replacement Analysis with Tax Considerations:

- O Incorporate the tax effects (gains / losses) whenever an asset is disposed of.
- O When calculating the net proceeds from sale of the old asset, any gains or losses can be omitted.
- O Incorporate the tax effects of depreciation allowances.
- O Whenever possible, replacement decisions should be based on the cash flows after taxes.

Question 4:
LECTURE 9

Boeing is considering replacing a machine that has been used to make a certain kind of fuselage bolt.
The financial data for the new improved machine is as follows:

- Investment cost $50,000 (installed)
- Estimated useful life of 5 years

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- Salvage value of $19,000 after the first year, decreasing at a rate of 10% each year.
- Operating and maintenance costs are expected to be $6,300 in the first year increasing at a rate of 27% each year.

The financial data for the existing machine is as follows:

- Investment cost $47,000 (installed), 2 years ago
- Estimated useful life of 7 years from time of purchase
- Salvage value of $16,000 after the first year (from today), decreasing at a rate of 12% each year.
- Current market value of $43,000
- Operating and maintenance costs for the next 5 years are expected to be $5,000 in the first year increasing at a rate of
- 60% each year.

With a MARR of 18%, calculate the following:

a. Calculate the economic service life for each option. **[4 + 4 points]**
b. What are your conclusions? **[2 points]**
c. When should the defender be replaced? What are your final conclusions? **[4 + 1 points]**

Question 5:
LECTURE 10

Consider the following 5 investment opportunities for a drug development project:

Project	Required Investment	Annual Savings over 10 years
A	$300	$105
B	$600	$180
C	$900	$210
D	$750	$150
E	$300	$90

Projects A and B are mutually exclusive.
Project C is contingent upon Project A.
Projects D and E are also mutually exclusive.

a. How many mutually exclusive decision alternatives are in the problem including the

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do-nothing alternatives? **[6 points]**

b. What is the total required investment for each alternative? **[2 points]**
c. What is the total annual savings over 10 years for each alternative? **[2 points]**

Question 6:
LECTURE 10

LittleZé Pharmaceutical Company needs to raise $23,000,000 in order to build a new process unit for a new drug they are launching in 2018.LittleZé Pharmaceutical Company's target capital structure calls for a debt ratio of 30%. Therefore, $16.1 million needs to be financed from equity from the following sources:

Sources	Amount
Retained earnings	$3,300,000
New Common Stock	$10,000,000
Preferred Stock	$2,800,000

The following details the financial data for both the common stock and preferred stock options:

	Common Stock	Preferred Stock
Market Price	$63	$129
Annual Cash Dividend	$9	$15
Annual Cash Dividend Growth Rate	11%	-
Issue Price	$59	$102
Flotation Costs	12%	8%

1. Calculate the cost of equity required to finance the new process unit. **[10 points]**

Question 7:
LECTURE 11

LittleZé Pharmaceutical Company needs to raise $11,000,000 in order to build a new process unit for a new drug they are launching in 2019.The following table lists 4 critical input variables for the financial analysis and the associated limits of uncertainty:

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Input	Lower Limit	Base Case	Upper Limit
Building Cost	80%	$2,300,000	125%
Equipment Cost	90%	$6,500,000	110%
Annual Revenue	90%	$3,500,000	110%
Annual O&M Costs	85%	$700,000	115%

With a MARR of 21% and a project life of 7 years, perform a sensitivity analysis on the data using PW as the figure of merit assessed.
a. Present the data in tabular format as shown in the lecture. **[6 points]**
b. Present the data in a spiderplot format. **[3 points]**
c. Which input has the biggest impact on the PW? **[1 point]**

Question 8:
LECTURE 12

Mark one correct answer for each of the following questions.
Please place a mark in the **O** symbol to indicate which is the correct answer.
There is ONLY one correct answer for each question.
Each question (a, b, c) is worth: [2 points]
Each question (d, e) is worth: [3 points]
Total marks for question 8: [12 points]

a. When comparing mutually exclusive risky alternatives (project A and B), if EA < EB and VA ≥ VB, where EA and EB represents the expected values of project A and B, and VA and VB represent the variances of project A and B Which project should be selected?

- **O** Select project A.
- **O** Select project B.
- **O** Select Project A or Project B, the decision is indifferent.
- **O** Do not select either project A or project B.

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b. A circle in a decision tree represents which of the following?

- O A decision node.
- O A possible alternative from the decision node.
- O A probability node.
- O None of the above.

c. True or False,

A random variable is a parameter or variable that can have more than one possible value simultaneously?

- O True
- O False

d. When should risk simulation be used?

_____

_____

_____

e. What is Decision Tree Analysis?

_____

_____

_____

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Question 9:
LECTURE 12

A microchip company is considering two mutually exclusive projects, both of which have an economic service life of one year with no salvage value. The initial cost and the net-year-end revenue for each project are given in the following table:

	Project 1		**Project 2**	
Initial Cost	$9,000		$8,000	
	Probability	**Revenue**	**Probability**	**Revenue**
Net Revenue given in PW	0.2	$10,000	0.25	$9,000
	0.55	$11,000	0.45	$10,500
	0.25	$12,000	0.3	$11,000

Assuming both projects are statistically independent of each other,
a. Calculate the expected value for each project. **[5 points]**
b. Calculate the variance for each project. **[5 points]**
c. Which project should be chosen? Why? **[2 + 1 points]**