E-120: Principles of Engineering Economics

Midterm Exam

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Name: _____ (please print)

SID: _____

- Clearly state all the mathematical expressions that are needed to solve the problems. **No credit will be given to numerical answers without the proper setup.**
- Answer each of the following questions in the space provided.
- Present your work in an organized and neat fashion.

Good Luck!

Problem	1 (40)	2 (30)	3 (30)	Total (100)
Score				

Problem 1 (40 points)

Today's date is Jan 1 2009. Fuzzy Inc. is a publicly-traded manufacturing company in California. The firm provides retirement benefits for its employees. According to the accounting law in California, the firm has to report the present value of their obligations due to these retirement benefits.

There are 10 employees with the following retirement dates:

Employee Number	1	2	3	4	5	6	7	8	9	10
Retirement Date	Jan 1 2015	Jan 1 2016	Jan 1 2017	Jan 1 2018	Jan 1 2019	Jan 1 2020	Jan 1 2021	Jan 1 2022	Jan 1 2023	Jan 1 2024

Each employee will receive **quarterly benefits** for 20 years for a total of 80 payments. The first quarterly payment of $10,000.00 is made on the day of the employee's retirement. Quarterly payment increases by 2% every quarter.

(a) What is the present value today of the obligations due to the retirement benefits of these **10 employees**? The discount rate is 12 percent **compounded monthly. (25points)**

(b) Fuzzy Inc. offers 275 corporate bonds (Fuzzy Inc. bonds) to employee #1 who will retire on Jan 1 2015 if the employee gives up her retirement benefits. She will receive the bonds today if she accepts this offer. The bonds are 8% coupon bonds that have 3 years left to maturity. The bonds make annual payments and they have a face value of $1000. Fuzzy Inc. already have the following zero-coupon bonds with face values equal to $1000:

Term-to-maturity	**Price**
1 year	$925.93
2 years	$889.99
3 years	$751.31

She will sell the bonds as soon as she receives them. She cares only about the present values of the alternatives. Should she accept the offer? **(15points)**

Problem 2 (30 points)

Phyllis H. Jeffrey is a financial analyst who covers the manufacturing industry. One of the companies she follows, Fuzzy Inc., is evaluating a new manufacturing facility. The financial figures for the project are as follows:

- Fixed capital outlay is $1,500,000.
- Investment in net working capital is $400,000 (at the beginning of the project). This investment is recovered at the end of the project.
- Straight-line depreciation is over a **six-year period** with zero accounting salvage value.
- Project life is 12 years.
- Additional annual revenues are $100,000.
- Annual cash operating expenses are reduced by $250,000.
- The fixed assets are sold for $500,000 in 12 years.
- Tax rate is 40%.
- Required rate of return is 12%.

What is the net present value of the project?

Problem 3 (30 points)

For each of the following statements, determine whether it is ***true*** or ***false***.
Justify your answer providing either a proof or a counter-example as appropriate.
(No explanation – No credit)

a. The following information is given:
- Bond A is a premium bond whereas bond B is a discount bond. The duration of bond A is equal to the duration of bond B. They have the same YTM and the same face value.

Bond A must have less interest rate risk than bond B has.

b. Suppose that a conventional cash flow stream has a negative cash flow at time zero. Its payback period must be less than or equal to its discounted payback period.

c. The following information is given:
- Loan A and Loan B are two 30-year mortgage loans. Both loans have a rate of 5%. The loan amounts of both loans are the same. Loan A has no fees of any kind, whereas loan B has closing costs of $3,000.

Monthly payment amount of loan A must be less than the monthly payment amount of loan B.

d. Assume that the dividend discount model holds. Managers should not focus on the current stock value because doing so will lead to an overemphasis on short-term profits at the expense of long-term profits.

e. Suppose that the IRR of a project is greater than its required rate of return. If the cash flow is conventional, its discounted payback period must be less than the lifetime of the project.