3.080 Engineering Economics EXAM

October 13, 2005

1. What is return on capital? Why do investors expect such returns? *(8 points)*

2. A firm has available the following set of investment options:

   Additionally, the firm can always lend money to other firms, thereby receiving a return of 6%. Or they can borrow up to $100,000 at a rate of 10%.

Project	Investment	Rate of Return
1	$10,000	20%
2	$10,000	15%
3	$10,000	10%
4	$10,000	8%
5	$10,000	7%
6	$10,000	4%

   a. What should the firm's MARR be if they had a budget for projects of $40,000? *(4 points)*

   b. What should the firm's MARR be if they had a budget for projects of $60,000? *(4 points)*

3. A couple with a newborn daughter wants to establish a college fund to pay for future college expenses. The couple can earn 7% (assume that this is a market based interest rate) compounding annually on their investments and estimate that future college costs will be $60,000 (nominal dollars) per year for four years. Assume that the daughter enters college at age 18 and that payments are made on each birthday. Also, assume that college costs must be paid at the beginning of the college year. What annual payment must be made to ensure that a sufficient amount has been saved to cover all costs when the daughter enters college? *(12 points)*

4. Determine the present worth of $5,000 paid every three months over a period of 7 years in the following two situations:

   a. The nominal interest rate is 12%, compounded quarterly (every 3 months) *(6 points)*

   b. The nominal interest rate is 12%, compounded monthly. *(6 points)*

5. Eradicator Food Prep, Inc. has invested $7 million to construct a food irradiation plant. The plant can process 26,000 kilograms of food in an hour, and will operate 4,000 hours per year. The expected operating costs would be $4 million per year (nominal dollars). The plant is expected to have a useful life of 15 years, with a net salvage value of $700,000 (nominal dollars). The firm's MARR is 15% -- a market based rate.

    a. What is the minimum amount that Eradicator should charge its customers per kilogram of food processed? *(8 points)*

    b. If the firm has a policy that the investment must be assessed over a 5 year study period, what would be the minimum amount to charge? In other words, how would your answer to part a change? *(4 points)*

    c. How would the answer to part a change if the 15% MARR was an inflation free rate, with general inflation expected to be 3% per year over the study period. *(4 points)*

6. You have the option to start a home painting business to cover some of the costs of going to college. You can setup your business three ways as shown below. Assume that the business will last 3 years with no salvage value. Your MARR is 8%.

	Option A	Option B	Option C
Investment	-$3,000	-$8,000	-$12,000
Annual Revenues - Expenses	$1,425	$3,333	$5,170
Market value at end of life	$0	$0	$0
IRR	20%	12%	14%

    a. Which of these options are financially acceptable? *(3 points)*

    b. Using the IRR method, which of the three options would you select? Show your work.
    (I realize that finding the IRR can be time consuming, so make sure to show and explain how you would solve the problem first, and then attempt to actually solve it.)
    (12 points – 9points for setting up correctly, 3 points for correct solution)

7. You are considering buying a new car worth $15,000. You can finance the car by either withdrawing cash from your savings account, which earns 8% interest or by borrowing $15,000 from your dealer for 4 years at 11%.

   If you leave the money in your savings account, you will earn $5,407 dollars in interest over the 4 years.

   $$Interest = FV - Investment = Investment(1+i)^N - Investment$$

   If you borrow the money from the dealer, you will pay only $3,609 in interest over the 4 years.

   Your financial advisor tells you that since $3,609 < $5,407, you should borrow the money, leaving your funds in the bank.

   Do you agree with this advice? Defend your reasoning with a numerical calculation *(12 points)*