

# Engineering Economics and Problem Solving, 4N4, 2014

## Tutorial/Assignment 2

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This tutorial (your second assignment) has one main goal: to get even more comfortable with the time value of money.

### Question 1 [5]

Who is the group chair this week? What are the other group member's roles this week? When did you meet this week? Who attended the meeting?

Create a Google document (not a spreadsheet), share it with the TA and myself, with the following name:

2014-4N4-Group-log-Group-NNN (where NNN is your group number, for example, A08)

You will keep adding to this group log file every week. Record in the group log the date and times when you meet, who attended, what the action items were from the meeting, and the responsibilities of everyone in your group.

This group log will be viewed every week to ensure it is complete. Add a new section for every week: this is currently week "03" in the course.

### Question 2 [5]

Discount a cash payment of \$43,788 dollars received in September 2017 into today's dollars, at the prevailing rate of inflation in Canada.

### Question 3 [3]

Describe whether investing in a project with a zero dollar NPV is acceptable.

### Question 4 [3]

What is the cash flow for a period in which the following happen:

- pay salaries to your employees of \$2,904,500
- receive a license fee revenue from a patent you allow your competitor to use: \$45,000
- pay property taxes to the city: \$9100
- sales of product 5z3: \$2,041,000
- sales of product 6z3: \$4,977,000
- insurance and liability coverage: \$58,500
- products for the office (tea, coffee, paper, etc): \$14,000
- purchase and installation of a new heat exchanger: \$213,000
- equipment maintenance: \$97,000

**Question 5 [10]**

Your company has excess steam available (400 metric tonnes per day) from your on-site generation plant and is considering selling it to a neighbouring site. Your generation system operates for 8000 hours a year and you are proposing selling at \$2/klb.

What is the present value (at time zero) of all revenues for the next 5 year time frame? Assume a time value of money of 10%.

**Question 6 [10]**

1. A manufacturer is considering two options: System A with cost of \$600,000, a service life of 7 years and savings of \$100,000 per year starting immediately at the time of installation. Or system B with cost of \$115,000, a service life of 15 years and savings of \$15,000 per year, also starting immediately. Which system has the fastest payback?
2. Calculate the present value of all cash flows, using a TVM of 5%. Add up the present values to calculate the net present value (NPV). Make a judgement based on this value on purchasing system A or B. Explain why the decision is different, and why this highlights the problem with payback period as a profitability measure.

**Question 7 [10]**

A local bakery is deciding to invest in an oven; they need one right away. Model A costs \$7000, is expected to last 6 years and have annual costs of \$1000 to maintain the oven. Model B costs \$12,000, has a life of about 5 years, and maintenance costs will be \$600 each year. The bakery has one main investor (their bank!) which charges 9% to borrow money.

Use an NPV analysis to recommend a choice to the bakery.

**Question 8 [10]**

The following 3 unequal-life capital projects exist. The alternatives are not dependent on each other; cash flows are in the thousands of dollars.

- A: Revenues of \$150 each year for 5 years, and a salvage value of \$50. Upfront capital expenditure at  $n = 0$  is \$180.
- B: Revenues of \$300 each year for 4 years, and a salvage value of \$60. Upfront capital expenditure at  $n = 0$  is \$200.
- C: Revenues of \$300 each year for 3 years, and a salvage value of \$80. Upfront capital expenditure at  $n = 0$  is \$200.

Your company has \$700 to spend on capital projects this year. Use an NPV analysis to decide how to proceed; your internal discount rate for time value of money is 20%. Assume revenues only start the year after capital expenditure (i.e. one year to purchase and install the capital items).

**Question 9 [12]**

A company buy a plug-flow reactor for \$945; it costs \$120 to prepare the building, engineering planning, safety and hazard analysis. The installation costs are \$500 and lasts 1 year. Once the reactor is running, we expect to operate it for 10 years. The salvage value is expected to be \$0 in the final year.

We could make a net revenue of \$205 every year in today's money, but we will inflate the revenue by 5% each year, based on historical market trends for the product. Also major maintenance is expected in the 6th year of full operation, at a cost of \$100, (also estimated in today's dollars, so use an inflation rate of 5% to inflate it to future dollars).

The company's MARR is 15%. All figures are in \$1000's of dollars.

Calculate the payback time, the net present value of all cash flows, the DCFRR. In this question, and from now on in the course you **must always** assume tax and depreciation are required, unless explicitly specified otherwise.

### Question 10

Please make reasonable assumptions, and avoid trying to bias the outcome of this question. You can assume 4 or 5 years of study, depending on your group's preference.

1. Prepare the cash flow values and a cash flow diagram for your income and expenses for four/five years of university. You can pick one of your group members to answer this part of the question.

Now continue your cash flow diagram for an additional 10 years or income and expenses, based on your group's expectations for the future, after graduation.

2. Prepare the cash flow values and a cash flow diagram for your income and expenses for four/five years after high school, as if you did not attend university, and also your income and expenses for 10 further years.
3. Calculate the present values for all cash flows from both situations. Calculate the net present value in both cases.
4. What is your conclusion so far in this study? You do not need to answer this question in these 4 sub-parts, however you should be present a logical and clear discussion on this topic.

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You do not need to do (or submit) question 10. It is for your own benefit.

You must submit answers to 3 of the questions from Question 5, Question 6, Question 7 and Question 8. There is extra credit if you do all 4 questions though.

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