ECE 472F **QUIZ #1** **2013-09-27**

The course textbook and a calculator are allowed.
No other aids are allowed.
Time: 50 minutes.

If a question appears to be ambiguous, state your interpretation/assumptions and then proceed on that basis.
The TAs have been instructed not to answer questions during the quiz.

Marking Scheme

Question 1	**–**	**5 marks**
Question 2	**–**	**10 marks**
Question 3	**–**	**5 marks**
Total		**20 marks**

Deadline for requesting a marking recheck to your TA: Friday, October 11th 15:00.
Please see Blackboard\Course Documents\Course Administration for quiz grading petition policy.

Question 1

One of the commercial activities of Urban Renewal Incorporated (URI) is to refurbish streetcars for public transit authorities in major metropolitan cities. Based on an estimated 37 streetcars per year, the fixed costs at URI have been established at $35 000 per streetcar and the variable costs as $72 000 per streetcar.

(a) What is the smallest average price that URI can afford to charge for refurbishing a streetcar?

(b) Because competition varies from city to city and it is difficult for one transit authority to learn what another transit authority pays, URI varies its prices from city to city. What is the smallest price per car that URI should charge any transit authority?

(c) The factory is large enough that a volume of 42 streetcars per year is possible without requiring any new assets or infrastructure. What is the smallest average price that URI can charge for refurbishing a streetcar if it anticipates an actual volume of 42 streetcars this year?

Be sure to explain the rationale, in a sentence or two, for each of your recommendations. **[5]**

Name: _____. Student #: _____

Question 2

The HydroEnergy Corporation is a small electricity utility that owns two power plants that it operates to provide electricity to its customers. HydroEnergy will always keep the two plants for redundancy purposes and its engineers have collected the following cost data on its two plants:

Plant Location	Annual Fixed Costs (excluding depreciation)	Annual Depreciation	Variable Costs	Maximum Capacity (MW-hr/year)
Ekwan River	3 500 000	300 000	$76x + 0.0004x^2$	60 000
Severn River	4 500 000	425 000	$61x + 0.0007x^2$	85 000

where x represents the yearly electrical output of each plant measured in megawatt-hours (MW-hr). HydroEnergy currently produces 100 000 MW-hr per year to meet the demand of its customers.

(a) How would you operate these two power plants to meet the current demand in the most economic manner? **[4]**

(b) The demand for electricity has increased by 60% recently due to a number of new manufacturing plants that have started operating and are now HydroEnergy customers. As a result, HydroEnergy is currently building a third power plant but it will take some time to complete. HydroEnergy is able to import power from Manitoba Hydro which costs $165.00 per MW-hr. The transmissions lines to Manitoba have a maximum capacity to support 60 000 MW-hr per year. With this new demand, how much power should HydroEnergy purchase? Be sure to discuss the power plants at Ekwan River and Severn River in your recommendation and clearly explain the rationale for your answer. **[3]**

(c) What is the new marginal cost for the HydroEnergy Corporation at the new operating point that you determined in Part (b)? Sketch a graph for the marginal cost function for electricity generation from the operating point that you determined in Part (b) to the maximum amount of power that HydroEnergy is able to supply to its customers. Be sure to comment on important points on your sketch. **[3]**

Question 3

Together with her three engineering business partners, a Professional Engineer has built up a medium-sized business over the past 5 years and now is a 25% owner of a company that is worth on the order of $12 000 000. The company is doing well and has a profit of $1 500 000 per year which is expected to continue into the foreseeable future. The company has a policy of paying out twenty per cent of the annual profits in dividends each year.

She has decided that now that the business is well established, more leisure time is in order and she would like to buy a recreational property in the country. She needs to raise $700 000 to buy this cottage. Her bank manager is willing to provide her with a line of credit (LOC) in that amount (i.e., a LOC is a loan on an interest-only basis - as long as the interest is being paid, the $700 000 does not have to be paid back for the foreseeable future) for an annual interest rate of 6.0%.

She doesn't like the idea of paying interest and would prefer to sell a portion of her equity in the company to raise the money as she believes there really aren't any costs, like interest, associated with that approach and only a small portion of the profit is paid each year out in dividends.

What advice would you give her? Be sure to quantify the monetary advantage of your recommendation and explain your recommendation fully. **[5]**