ECE 472F - PROBLEM SET #6 (suggested completion date: December 4th, 2015)

1. The Ministry of Tourism and Recreation is evaluating several proposals to build a recreational area within a provincial park. An environmental impact study has been completed and reviewed by the appropriate government agencies. Initial cost and benefit estimates have been obtained for three mutually exclusive alternatives and a presented in the table below. Each alternative assumes that a user fee will be charged to gain admission to the recreational area. The Ministry is not obligated to proceed with any of the alternatives.

	Initial Estimate (Present Value - $000)		
Alternative	**A**	**B**	**C**
Benefits - Recreation	420	260	590
Disbenefits - Congestion	55	50	90
Disbenefits - Pollution	7	5	15
Construction Costs	275	225	440
Admission Fee Revenue	40	10	70

The Ministry uses B/C ratio analysis in its public project evaluations.

(a) Which alternative should the Ministry select using the initial estimates outlined above?
(b) Local politicians are in favour of Alternative C because of the increased benefits that it brings to the area. By what percentage would the admission fee need to increase for Alternative C to be better than your recommendation in Part (a)?

2. The Ministry of Transportation pays the Great Lakes Company to ferry cars across a bay that effectively splits a large city in the province. The Great Lakes Company has submitted a bid of $5.0 million per year (to be paid by the province) for 15 years to provide the service since their current contract will run out shortly. The benefit associated with the ferry in time savings, reduction in gasoline consumption, etc., is estimated at $3.00 per car. A low-level bridge can be constructed that will increase the user benefits to $4.50 per car, mainly due to the reduced time to cross the bay. The low-level bridge will have a first cost of $30.0 million and annual maintenance charges of $1.8 million. A second bridge design will cost $37.0 million to implement with $2.5 million annual maintenance costs. The user benefits are estimated at $5.60 per car with the second bridge design. There are no other costs or salvage values, and a 15-year bridge life has been assumed. The Ministry uses an 8 percent interest rate and for planning purposes has estimated that 2 million cars per year will use either the ferry or a bridge. The Ministry uses B/C ratio analysis in its evaluation of public projects.

(a) Make a recommendation to the Ministry as to how they should proceed. Use an annual worth approach.
(b) The provincial government has a chronic funding shortfall problem and has decided to use the "opportunity cost" approach to select the appropriate interest rate in evaluating its public works projects. Discuss this approach and how it will affect the interest rate that the government will use in its evaluation of public projects?
(c) Use the "opportunity cost" approach that you outlined in Part (b) to re-evaluate your recommendation in Part (a). At what approximate interest rate (the nearest percentage point) will your recommendation no longer be in the public interest? (For this question, only re-evaluate the last pair-wise comparison from Part (a) at the new interest rate.)

3. Tennis enthusiasts in a small town would like to upgrade their tennis court facility to an indoor one so that they can play during bad weather. Someone suggested that they band together to form a small business to build and operate the tennis facility. The two courts together with a small lounge could be housed in a structure that would cost $100 000 to construct. The facility would have a 10-year life and a residual value of $20 000. Annual operating expenses would be $18 000. For the purposes of the economic analysis, assume that the facility would be open 14 hours per day for 320 days each year. Use a before-tax analysis.

    (a) At a charge of $4.50 per hour for playing time on a court, how many hours would the courts have to be rented each year for the investors to break even on construction and operating costs? Assume a rate of return of 10 percent.
    (b) Develop a graph of the utilization rate required to yield before-tax rates of return between 10 and 20 percent. Would you recommend the investment? Why?

4. A project under consideration can be described by the following estimated parameters:

    First Cost = $500 000; Annual Sales = $200 000; Annual Costs = $75 000;
    MARR= 10%; and Economic Life = 6 years.

    The project engineer believes that the Annual Sales estimates are accurate within a +/- range of 25%. Considerable effort has been put into assessing the First Costs and that estimate has a confidence level of +/- 5%. Assume that the Annual Costs are known to a high degree of certainty. Estimate the probability that this project will be unprofitable using a before-tax analysis.