UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE AND ENGINEERING
MIE 374 Final Exam
Economic Analysis and Decision Making
April 13, 1998

J.S.Rogers

tes:
1) Marks as indicated [n]
2) Type C exam - Aid sheet only allowed
3) Numerical table will be handed out
4) Explain clearly the rationale for the steps in your procedures. Full marks will NOT be given for numbers only.

1) Explain your understanding of and the significance of the following for the economic design of engineering systems..
   (a) [3] Opportunity cost
   (b) [4] Capital asset pricing model
   (c) [3] Two properties of probability required to analyze imperfect information

2) A province is considering two different types of bridge design.
   (Costs and values in $000)

	Design Type	
Basic data	A	B
initial construction cost	200	250
Renewal cost, end of service life	100	125
Annual maintenance cost	1.0	1.5
Periodic repairs every 5 years	5.0	2.0
Salvage Value at end of service life	10	15
Service life	20	30

   (a) [15] Assuming a MARR of 6% and a planning horizon of 60 years, compute the B/C ratio for each design.

   (b) [10] Show how to find which design should be selected and then find the best design?

You have the following accounting information about a firm (in $000).

Beginning inventory	34		
operating expenses	22	new purchases	85
land value	25	accounts receivable	3.0
office equipment	15	ending inventory	25
income taxes	12	net income	27.4
nonoperating revenue	5	cash dividend	11
depreciation	10	new borrowing	21

Show how to find the total sales revenue for the period (explain clearly) and then compute the value.

A firm is considering either leasing or buying a small computer system. If purchased, the initial cost will be $200,000; annual O&M costs will be $80,000 per year. Based on a 5 year planning period the computer will have a salvage value of $50,000 at that time. If the computer is leased, annual O&M in excess of annual lease payments will be $60,000 per year. The MARR is 10 %.

(a) [15] What annual end of year lease payment will make the firm indifferent between buying and leasing?

(b) [10] Suppose the machine can be depreciated at 20% per year (CCA) over 5 years and the business is profitable with a tax rate of 50%, what annual end of year lease payment will make the firm indifferent between buying and leasing?

(c) [10] Suppose in addition to the situation in (b) the firm borrows $100,000 to buy the machine, what annual end of year lease payment will make the firm indifferent between buying and leasing?

5) [10] Suppose we have a supply curve $c(v) = c_0 + c_1 v$ and a demand curve $p(v) = p_0 - p_1 v$ where v is the volume of transactions. If we then apply a sales tax t per unit of output, find an expression for the deadweight losses associated with the movement from the old equilibrium to the new equilibrium.