UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE AND ENGINEERING

FINAL EXAMINATION, APRIL 1997

MIE 374S-Engineering Economics

Type X
Textbook Only Allowed

Examiner: J.S.Rogers

Note:
1) Marks as indicated [n]
2) Text only allowed
3) Explain clearly the rationale for the steps in your procedures. Full marks will not be given for answers only.

1) Explain your understanding of and the significance of the following.

a) [2]Capital cost factor
b) [3]The primary effect of taxes on the lease-buy decision
c) [3]The proper incorporation of user costs into benefit-cost calculations and the primary effect these costs have on the analysis.
d) [3]The main difference between a full portfolio model and a portfolio model based on the index concept
e) [3] The use of Bayes' Theorem in decision tree analysis

2) [25] You have been given the following data (in $1000)for a company (at year end). Construct an income statement and a balance sheet from this data.

accounts payable	27.5
accounts receivable	32.0
advertising expense	2.5
bad debt expense	1.1
buildings net	14.0
cash	45.25
common stock	125.0
cost of goods sold	311.25
depreciation expense- buildings	0.9
gov't bonds	25.0
income taxes	9.35
insurance exp	0.6
interest exp	0.5
inventory (year end)	42.0
land	25.0
machinery net	3.4
mortgage due May 30, 1999	5.0
office equip net	5.25
office supplies exp	2.02
other exp	7.0
prepaid exp	3.0
retained earnings	?
salaries exp	69.0
sales	421.4
taxes payable	2.5
wages payable	0.6

3) A firm is considering investing $765,000 in a material handling system that will reduce annual operating costs by $150,000 per year over a 15 year planning period.

(a)[10]Perform a before-tax analysis using a MARR of 20%. Is the investment justified?

(b) [20]Suppose further analysis indicates $540,000 of the investment is for equipment; the remaining $225,000 is for expense items. A 50% tax rate, 10% investment tax credit at time 0, eight year write-off period, 20% declining balance depreciation method and 15% after-tax MARR are to be used. Is the investment justified on an after-tax basis?

4) An old (fully depreciated) asset cost $8000 five years ago. It has O&M costs of $1500 this year and these increase by $1500 each year. The current salvage value is $4500 and will decline by $750 per year. The new asset costs $9000, has O&M costs of $1400 per year increasing by $500 per year and salvage value of $5000 after one year declining by 10% each year. Depreciation is straight line over 5 years. The firm has a tax rate of 40% and a MARR of 15%

(a)[20]What should the firm do now?

(b) Suppose a bright young U of T Eng Sci graduate says "This old business is really better than the company gives it credit for". The 9T8 finds that a risk free bond returns 3%/yr and the appropriate market returns 8%/yr but with a standard deviation of 4%.

(ii) [5]Find the value for beta for the firm at its 15% MARR

(iii) [1]If the project has a beta of 0.75, find the appropriate discount for it.

(iv) [5]Compare the PW of the best approach using the answer to (ii) with that found in (a)