

Carleton University
Department of Civil and Environmental Engineering
Engineering Economics (ECOR 3800)

ASSIGNMENT # 2

Issued November 05, 2009 Due Date: July 20, 2010 at 12:00 noon

Drop off location: Filing cabinet near the entrance to the Civil and Environmental
 Engineering office.

The cabinet located to the right of room 3424 ME.

Question (1) (15 marks)

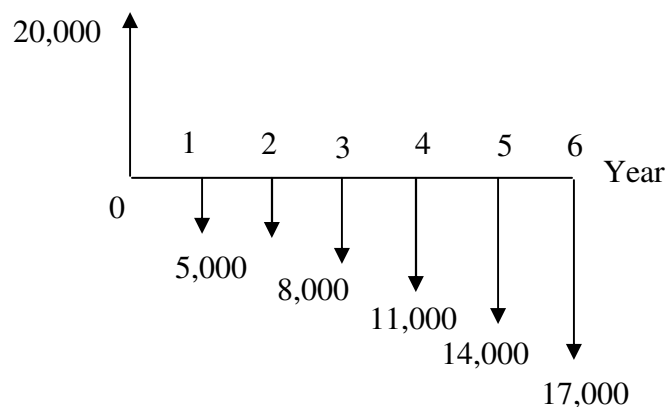
(A)

Consider the following cash flows and compute the equivalent annual worth at $i = 12\%$

A_n		
n	Investment	Revenue
0	-10,000	
1		2000
2		2000
3		3000
4		3000
5		1000
6	+2000	500

(B)

Consider the cash flow diagram. Compute the equivalent annual worth at $i = 12\%$



Question (2) (12 Marks)

A large food-processing corporation is considering using laser technology to speed up and eliminate waste in the potato-peeling process. To implement the system, the company anticipates needing \$3 million to purchase the industrial-strength lasers. The systems will save \$1,200,000 per year in labor and materials. However, it will require an additional operating and maintenance cost of \$250,000. Annual income taxes will also increase by \$150,000. The system is expected to have a 10-year service life and will have a salvage value of about \$200,000. If the company's MARR is 18%, justify the economics of the project based on:

- (a) PE method
- (b) FE method
- (c) AE method

Question (3) (13 Marks)

Consider the following project balances for a typical investment project with a service life of 4 years:

n	A_n	Project Balance
0	-1000	-1000
1	()	-1100
2	()	-800
3	460	-500
4	()	0

- (a) Construct the original cash flows of the project.
- (b) Determine the interest rate in computing the project balance.
- (c) At $i = 15\%$, would this project be acceptable?

Question (4) (15 Marks)**(A)**

Consider the following two mutually exclusive investment alternatives:

Net Cash Flow		
End of year	Machine A	Machine B
0	-1000	-2000
1	900	2500
2	800	800+200
3	700	

Suppose that your firm needs either machine for only 2 years. The net proceeds from the sale of machine B is estimated to be \$200. What should be the required net proceeds from the sale of machine A so that both machines could be considered economically indifferent at an interest rate of 10%?

(B)

Consider the following two mutually exclusive investment projects. Assume that the MARR=12%.

Project's Cash Flow		
n	A	B
0	-4200	-2500
1	2610	1210
2	2930	1720
3	2300	1500

- (a) Which alternative would be selected using the PE criterion?
(b) Which alternative would be selected using the FE criterion?

Question (5) (15 Marks)

An electric motor is rated at 10 horsepower (HP) and costs \$800. Its full load efficiency is specified to be 85%. A newly designed, high-efficiency motor of the same size has an efficiency of 90%, but costs \$1200. It is estimated that the motors will operate at a rated 10 HP output for 1500 hours a year, and the cost of energy will be \$0.07 per kilowatt-hour. Each motor is expected to have a 15-year life. At the end of 15 years, the first motor will have a salvage value of \$100. Consider the MARR to be 8%. (Note: 1HP = 0.7457 kW.)

- (a) Determine which motor should be installed based on the PE criterion.
- (b) In (a), what if the motors operated 2500 hours a year instead of 1500 hours a year? Would the same motor in (a) be the choice?

Question (6) (15 Marks)

Consider the following two mutually exclusive investment projects, which have unequal service lives.

Project Cash Flow		
n	A1	A2
0	-900	-1800
1	-400	-300
2	-400	-300
3	-400+200	-300
4		-300
5		-300
6		-300
7		-300
8		-300+500

- (a) What assumption(s) do you need to compare a set of mutually exclusive investments with unequal service lives?
- (b) With the assumption(s) defined in (a) and using $i = 10\%$, determine which project should be selected based on PE analysis.
- (c) If your analysis period (study period) is just 3 years, what should be the salvage value of project A2 at the end of year 3 to make the two alternatives economically indifferent?

Question (7) (15 Marks)

Consider the cash flows for the following investment projects (assume MARR = 15%):

Project's Cash Flow			
n	A	B	C
0	-3000	-4000	-5000
1	1000	1600	1800
2	1800	1500	1800
3	1000	1500	2000
4	400	1500	2000

- (a) Suppose that projects A and B are mutually exclusive. Which of these three projects would you select based on the AE criterion?
- (b) Assume that projects B and C are mutually exclusive. Which of these three projects would you select based on the AE criterion?