

# ENGR 301 - Assignment 6

**Deadline: due 16:00, Thursday November 17, 2016**

Assignments must be submitted on-line using the multiple choice answer sheet on the Moodle course website. No submissions will be accepted after the deadline.

## Question 6-1

How much would the owner of a building be justified in paying for a sprinkler system that will save \$750 a year in insurance premiums if the system has to be replaced every 20 years and has a salvage value equal to 10% of its initial costs? Assume money is worth 6%.

The best (closest) answer is:  \$8888     \$7987     \$9656     \$8410

## Question 6-2

A machine costs \$980,000 to purchase and will provide \$200,000 a year in benefits. The company plans to use the machine for 13 years, and then will sell the machine for scrap, receiving \$20,000. The company interest rate is 12%. Which one of the following statements is correct?

- (a)  $NPW = \$980,000 + \$200,000 (P/A, 12\%, 13) + \$20,000 (P/F, 12\%, 13)$
- (b)  $NPW = -\$980,000 + \$200,000 (P/A, 12\%, 13) + \$20,000 (P/F, 12\%, 13)$
- (c)  $NPW = -\$980,000 + \$200,000 (P/A, 12\%, 13) - \$20,000 (P/F, 12\%, 13)$
- (d)  $NPW = \$980,000 - \$200,000 (P/F, 12\%, 13) - \$20,000 (P/A, 12\%, 13)$

answer (a)     answer (b)     answer (c)     answer (d)     none

## Question 6-3

The General Hospital is evaluating new office equipment offered by four companies. In each case the interest rate is 15% and the useful life of the equipment is 4 years. Use a Net Present Worth analysis to determine the company from which you should purchase the equipment.

	Company A	Company B	Company C	Company D
First cost	\$15,000	\$18,000	\$25,000	\$20,000
Maintenance and operating cost (annual)	1,600	1,100	400	900
Annual benefit	8,000	9,000	13,000	11,000
Salvage value	3,000	3,500	6,000	4,500

Company A     Company B     Company C     Company D     none

## Question 6-4

How much must be deposited in an account to have annual withdrawals of \$1000 forever? Interest is compounded quarterly and the interest rate is 9% for the first 10 years and 10% thereafter.

\$9,922     \$10,000     \$10,964     \$10,280

**Question 6-5**

A pump is needed for 10 years at a remote location. The pump can be driven by an electric motor if a power line is extended to the site. Otherwise a gasoline engine will be used. Use a present worth cash flow analysis, using the following data and a 10% interest rate, to determine how the pump should be powered. Calculate  $PW_{gas}$  (present worth for gasoline option) and  $PW_{electric}$  (present worth for electric option).

	<b>Gasoline</b>	<b>Electric</b>
First Cost	\$2400	\$6000
Annual Operating cost	1200	750
Annual Maintenance	300	50
Salvage value	300	600
Life in years	5	10

Which of the following statements is the best answer:

- (a)  $PW_{gas} = -\$7,900$ ;  $PW_{electric} = -\$10,685$ ; Choose gasoline pump
- (b)  $PW_{gas} = -\$15,550$ ;  $PW_{electric} = -\$17,588$ ; Choose gasoline pump
- (c)  $PW_{gas} = -\$12,805$ ;  $PW_{electric} = -\$10,685$ ; Choose electric pump
- (d)  $PW_{gas} = -\$10,508$ ;  $PW_{electric} = -\$9,685$ ; Choose electric pump

- answer (a)     answer (b)     answer (c)     answer (d)     none

**Question 6-6**

The General Hospital is evaluating new office equipment offered by three companies. Interest rate is 8%.

	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>
Cost	\$500	\$600	\$700
Annual benefit	130	115	100
End of useful life salvage value	0	250	180
Useful life (yrs)	5	5	10

Use an annual cash flow analysis to determine from which company you should purchase the equipment.

- Company A     Company B     Company C     none

**Question 6-7**

If the analysis rate is 12%, compute the value of X that makes the two alternatives equally desirable.

	<b>A</b>	<b>B</b>
Cost	\$800	\$1000
Uniform annual benefit	\$230	\$230
Useful life, in years	5	X

- 6 years     7 years     8 years     9 years

### **Questions 6-8 and 6-9**

The General Hospital is evaluating new office equipment offered by four companies. The useful life of the equipment is 4 years.

	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>	<b>Company D</b>
First cost	\$15,000	\$18,000	\$25,000	\$20,000
Maintenance and operating cost (annual)	1,600	1,100	400	900
Annual benefit	8,000	9,000	13,000	11,000
Salvage value	3,000	3,500	6,000	4,500

6-8: The internal rate of return for Company A is close to:

- 20%                       25%                       30%                       35%

6-9: When doing an incremental analysis looking at it from an investment perspective the companies need to be ranked as follows:

- A-B-C-D                       A-B-D-C                       C-D-B-A                       D-C-B-A

### **Question 6-10**

The General Hospital is evaluating new office equipment offered by three companies.

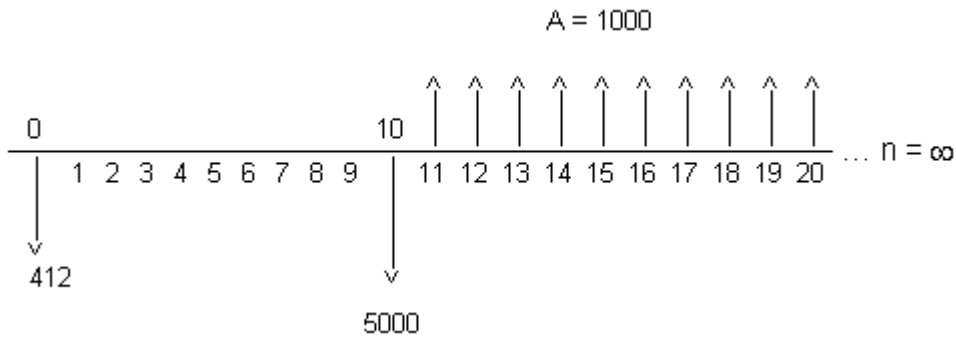
	<b>Company A</b>	<b>Company B</b>	<b>Company C</b>
Cost	\$500	\$600	\$700
Annual benefit	130	115	100
End of useful life salvage value	0	250	180
Useful life (yrs)	5	5	10

The incremental rate of return between Company B and Company C is close to:

- 7.5%                       8.5%                       9.5%                       10.5%

**Question 6-11**

For the following diagram, compute the rate of return:



- 12%                       15%                       18%                       21%

**Question 6-12**

Peter Minuit bought an island from the Manhattoes Indians in 1626 for \$24 worth of beads and trinkets. The 1991 estimate of the value of the land on this island was \$12 billion (1 billion =  $10^9$ ). What rate of return would the Indians have received if they had retained title to the island rather than selling it for \$24? The rate of return is close to:

- 4.3%                       5.6%                       6.6%                       7.8%

**Question 6-13**

Two mutually exclusive alternatives A and B are being considered:

Year	0	1	2	3	4	5
<b>A</b>	-\$2500	746	746	746	746	746
<b>B</b>	-\$6000	1664	1664	1664	1664	1664

The minimum attractive rate of return is 8%. After calculation we can find that the internal rates of return: for A,  $IRR_A = 15\%$ , for B,  $IRR_B = 12\%$  and for B-A,  $IRR_{B-A} = 9.8\%$ . Which of the following statements is correct?

- (a) Select A because  $IRR_A > IRR_B$   
 (b) Select neither A nor B because  $IRR_A > MARR$  and  $IRR_B > MARR$   
 (c) Select B because  $IRR_{B-A} > MARR$   
 (d) Select A because  $IRR_{B-A} > MARR$
- answer (a)     answer (b)     answer (c)     answer (d)     none