Instructions: Spend 1 - 1-1/2 hours on this test and then compare your answers with the solutions provided separately.

Disclaimer: Your Test 1 will have different questions on it.

ISE 2014 Sample Test #1

Question 1 (20 points)

Refer to Example 2-9 on pages 48-50.

(16 pts) (a) If the cost of electricity is $0.04 per kwh (instead of $0.074 per kwh), which amount of insulation should be recommended? Show all work to receive full credit. Recall that the study period is 25 years.

(4 pts) (b) What is the basic tradeoff being made in this problem?

Question 2 (15 points)

A large work area can be illuminated satisfactorily by either one of two methods. By using incandescent lighting, the initial cost is low ($10,000) but the operating costs are relatively high ($12.50 per hour). The other lighting system utilizes fluorescent lamps having a high initial cost $25,000) but relatively low operating costs ($4.25 per hour).

Only one year (8,760 hours) is to be used in deciding between these two types of lighting. Furthermore, the number of hours of operation during the year (H) must be considered in making the decision.

(10 pts) (a) What value of H makes the costs of both types of lighting the same?

(5 pts) (b) Which lighting system would you recommend and why?

Question 3 (15 points)

In the design of an automobile radiator, an engineer has a choice of using either a brass-copper alloy casting or a plastic molding. Either material provides the same service. However, the brass-copper alloy casting weighs 25 pounds, compared with 16 pounds for the plastic molding. Every pound of extra weight in the automobile has been assigned a penalty of $4 to account for increased fuel consumption during the life cycle of the car. The brass-copper alloy casting costs $3.35 per pound while the plastic molding costs $7.40 per pound (no machining is required for plastic). Machining costs per casting are $6.00 for the brass-copper alloy. Which material should the engineer select, and what is the difference in unit costs?

Question 4 (15 points)

You plan to provide a retirement fund for yourself by making end-of-year deposits of $1,000 for each of the next 35 years into a fund which earns 5% interest (i = 5% per year). After 35 years you will withdraw $5,082 per year until the fund is exhausted.

(5 pts) (a) Draw a cash flow diagram from your perspective (viewpoint).

(7 pts) (b) How long (to the nearest year) will it take to exhaust the fund that you have built up for 35 years?

(3 pts) (c) List at least 2 key assumptions that are necessary in your answer to (b).

Question 5 (15 points)

(10 pts) (a) In view of the information given below, determine the value of each "?" in the following table. The loan is to be repaid in three equal end-of-year payments. Hint: This is remarkably similar to Plan 3 on page 68.

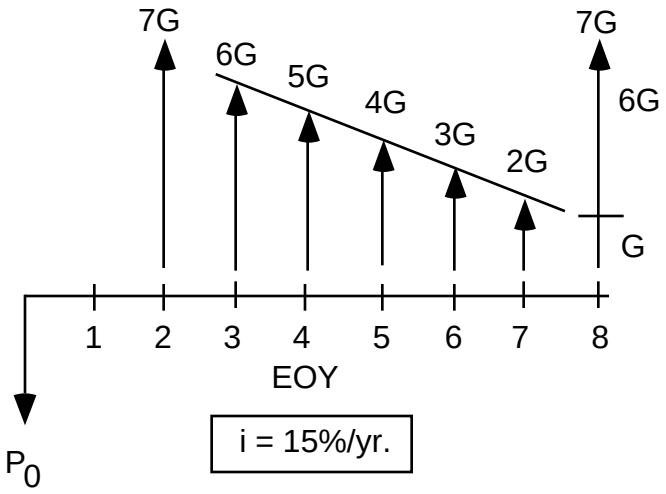
Loan principal = $10,000
Interest Rate/Yr. = 8%
Duration of Loan = 3 Yrs.

EOY k	Interest Paid	Principal Repayment
1	$800	?
2	$553.60	$3,326.40
3	?	?

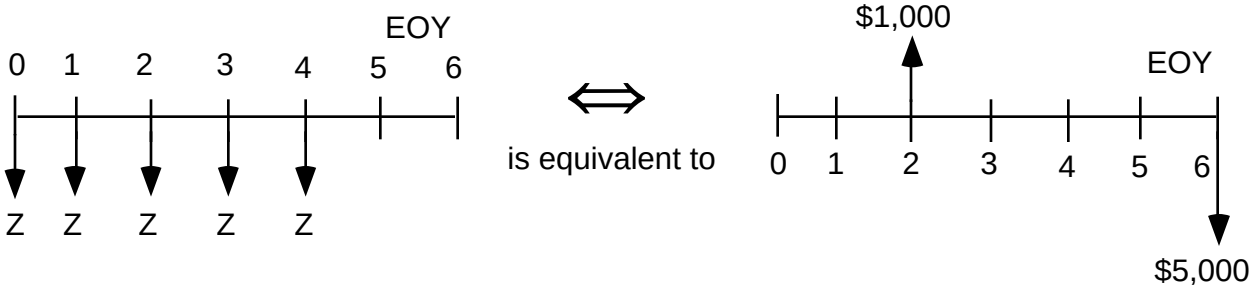
(5 pts) (b) Suppose the 8% interest rate in part (a) is a nominal interest rate per year. If compounding occurs monthly, what is the effective annual interest rate? Show all work.

Question 6 (20 points)

(8 pts) (a) In the following cash flow diagram, what is the equivalent value of P_0 in terms of G? Use a uniform gradient in your formulation. Set up only.



(10 pts) (b) Set up an expression for the value of Z on the left-hand cash flow diagram that establishes equivalence with the right-hand cash flow diagram. The nominal interest rate is 12%, compounded quarterly.



(2 pts) (c) Refer to Example 2-2 on pages 24-25. If the cost per mile had been based on driving 30,000 miles per year (rather than the 15,000 miles per year), how would the cost of the 800-mile trip ($158.40) change?