Homework 1

Date due: Friday, January 26, 2018

A.   Reading assignment

- Read Chapter 1 in **Ravindran**.
- Read Chapter 1 in **Clemen.**

B.   Problem solutions

You need to hand in the solutions to the following six problems

1.   A segment of automatically controlled highway is being equipped with sensors spaced equally along its length. The maximum error in estimating traffic volume, which occurs halfway between any two sensors, can be expressed as $(d/s)^2$, where d is the length of the segment and s is the number of sensors. Each sensor costs p dollars, and designers want to reduce the maximum error as much as possible within a budget for sensors of b dollars. Identify each of the following for this design problem:

   (a) the decision variable
   (b) the input parameters
   (c) the objective function
   (d) the constraints

2.   A factory has two production lines available to make a product. The first can produce one lot of the product in t_1 hours at a cost c_1, and the second requires t_2 hours and a cost c_2. The plant manager wishes to find the least costly way to produce b lots in a total of at most T

hours. An integer number x_1 will be produced on line 1 and an integer number x_2 on line 2. Identify each of the following for this design problem:

(a) the decision variables

(b) the input parameters

(c) the objective function

(d) the constraints

3. Determine whether each of the following can be validly modeled only as a random variable or if a deterministic quantity can suffice:

(a) the number of inches of rainfall in a city over the next 14 days

(b) the average 14-day rainfall in a city

(c) the market price of a common stock 1 week ago

(d) the market price of a common stock 1 week from today

(e) the seating capacity of a restaurant

(f) the number of customers who will arrive at a restaurant this evening

(g) the production rate of an industrial robot subject to frequent breakdowns

(h) the production rate of a highly reliable industrial robot

(i) factory demand for a bulldozer model over the next 7 days

(j) factory demand for a bulldozer model over the next 7 years

4,5,6. Problems 1.1, 1.11 and the questions on the *Dupont and Chlorofluorocarbons* case study in **Clemen**.