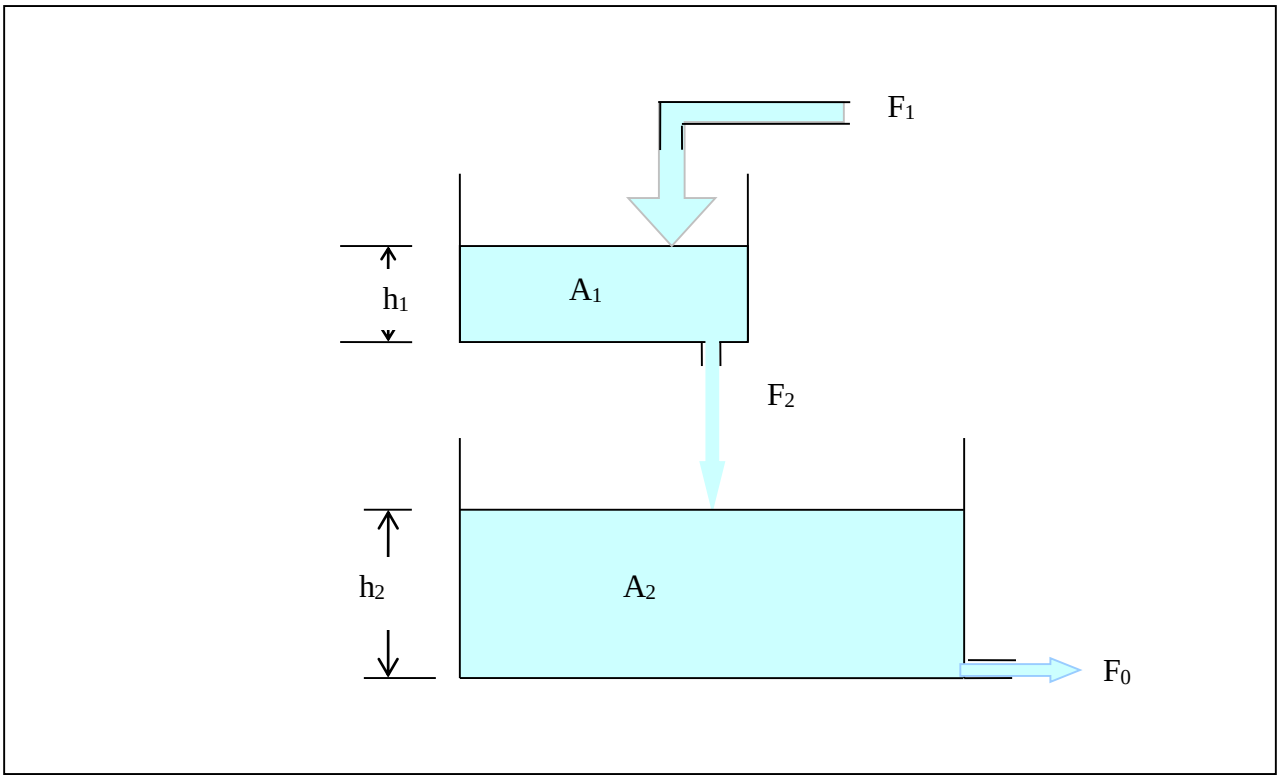
Assignment 3

1. The "coupled tank" problem is described as a set of two differential equations as follows:

   $$A_1.(dh_1/dt) = F_1 - F_2$$
   $$A_2.(dh_2/dt) = F_2 - F_0$$

   Where; ***A*** is the area of the tank, ***h*** is the height of the fluid, and ***F*** is the rate of flow.

a. Write a simulation program to solve the following
b. Describe how you would run the simulation for a case such as : A_1 =1.0, A_2=2.0, F_0=0.02, F_1=.01, F_2=.01 , and varying initial values for (h_{10}, h_{20}) such as: (0,0), (2,0), (0,1.5), (1,0), (0,1).
c. Analyze your results and discuss them?

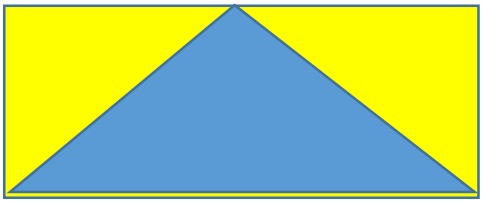


2. Show the pseudo-code for computing random variates that follow the triangle distribution (with probability density function f(x) defined below) using the inverse distribution function method. Assume there is a function rand() that returns random numbers that are uniformly distributed between 0 and 1.

   Show all work in deriving your solution.

   $f(x) = x$ for $0 \leq x < 1$
   $f(x) = 2-x$ for $1 \leq x < 2$
   $f(x) = 0$ otherwise

   Report and explain some sample results.



3. In an interview, a human resource (HR) specialist asks candidates 20 questions with 5 possible multiple choice answers to each question. What is the probability of the following candidates for success given the following assumptions:

   a. HR has the last answer always correct, candidates select answers at random.
   b. HR's solution is in a random location and student selects an answer at random.

   Note: assume the interview has only 3 questions, trace some (approx. 10) random candidates for each scenario but run a larger sample on the computer and do not respond philosophically without support.

4. A software process is represented as a network with some process time between nodes having Uniform distribution (U) and others with Deterministic values.
   a. Analyze the performance of the system,
   b. After adequate samples, show how you quantify the criticality of each path.
   c. Briefly explain your redesign perspective of such a system.

   - (1, 2): U (4,6)
   - (1, 5): 6
   - (2, 3): 6
   - (2, 4): U (6,8)

- (3, 4): U (4,8)
- (4, 7): 4
- (5, 3): 8
- (5, 4): 11
- (5, 6): U (8,10)
- (6, 7): U (9, 10)