CE 540 Unsteady Flows in Rivers and Pipe Networks,
Homework 3 / Mini Project 3, Fall 2013
Instructor: Arturo Leon

Name of student: _____ **Due date**: November 19

1. **Miniproject**: Considering the hypothetical combined sewer system (CSS) used in the ITM lab session, and assuming that the gate at node "gate1" is kept completely open during the storm, determine if transients occur in this hypothetical CSS. If there are transients, find the location of these transients (e.g., pipe IDs), peak pressures and times of occurrence.

   - The data for the hypothetical combined sewer system can be downloaded from http://web.engr.oregonstate.edu/~leon/ITM.htm

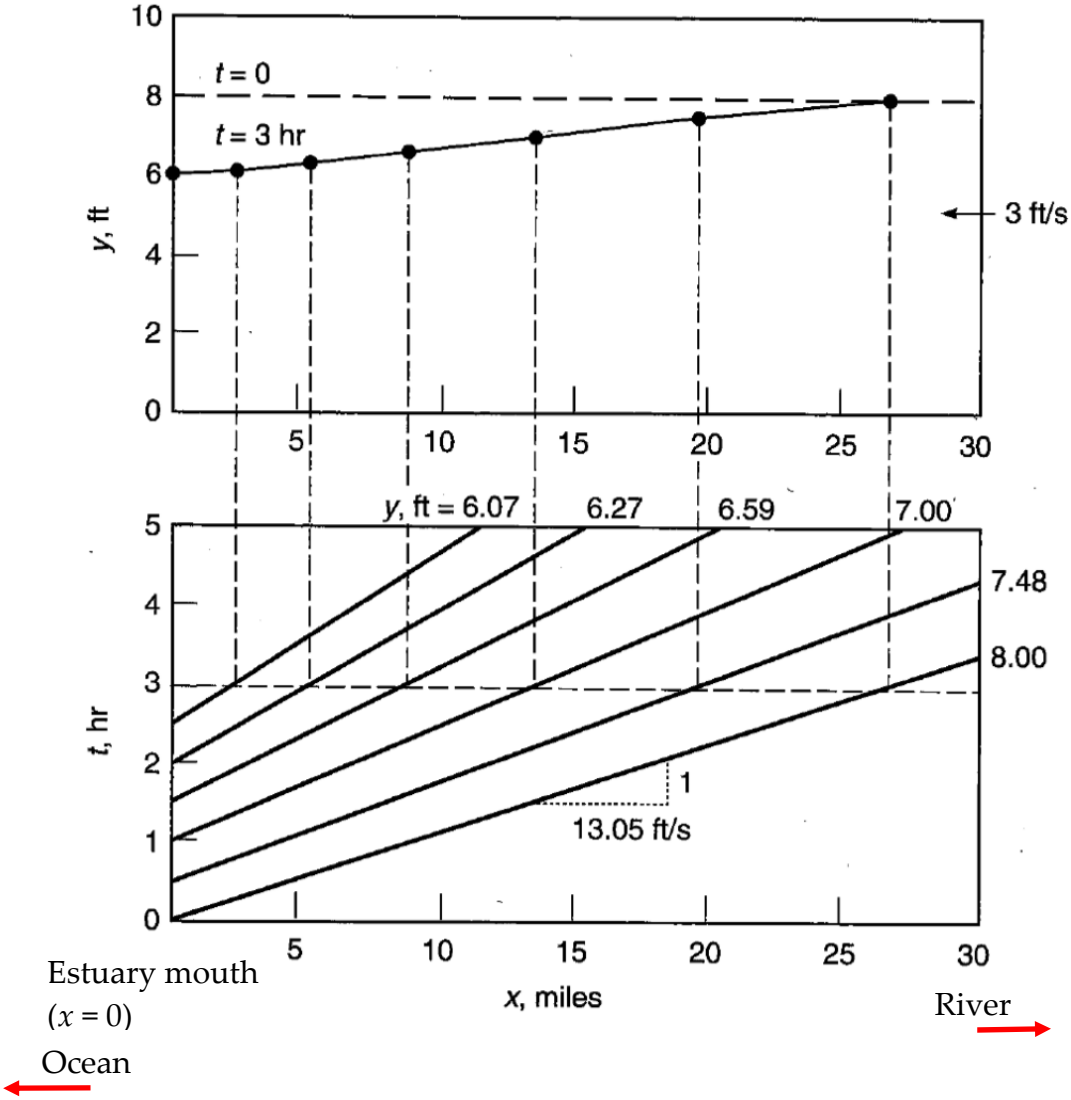
   - State your assumptions.

Homework:

2. The initial flow conditions in an estuary are given by a velocity V_o = 3ft/s (0.914 m/s) and depth y_o = 8ft (2.44 m), as shown in the figure below. The boundary condition at the mouth of the estuary (x = 0), is given by

$$y = 8 - 2\cos\left(\frac{\pi t}{6} - \frac{\pi}{2}\right) \quad \text{For } 0 \le t \le 3 \text{ hr}$$

in which "t" is time in hours and y is the depth in feet at the estuary mouth (x = 0).
(a) The depth profile at t = 3 h is shown below. Describe the procedure of how this profile was obtained
(b) At t = 2 h, how far upstream will the river water level just begin to start falling? (Neglect bed slope and resistance effects: S_o = 0, S_f = 0).



3. A 2 m wide rectangular channel carries a discharge of 1 m^3/s at a flow depth of 1m. If the discharge is suddenly increased to 4 m^3/s, find the height of the resulting surge (i.e., the increase in flow depth) and its velocity.

4. A 2 m wide rectangular channel originates from a lake ($X = 0$) and carries a discharge of 1 m^3/s at a flow depth of 1m. The lake level starts decreasing such that the flow depth in the channel varies linearly from 1 m (at $t = 0$) to 0.5 m in 1000 seconds. Using the method of characteristics, find the answer to the following questions (Neglect bed slope and resistance effects: $S_o = 0$, $S_f = 0$).
   a) How long will it take for a point 2 km downstream from the lake to feel the effect of the change in depth?
   b) At this time, what would be the flow depth at a point 1 km from the lake?
   c) When would the flow depth be 0.75 m at this point?