

**1.85 WATER AND WASTEWATER TREATMENT ENGINEERING
HOMEWORK 2 – DUE FEBRUARY 17, 2005**

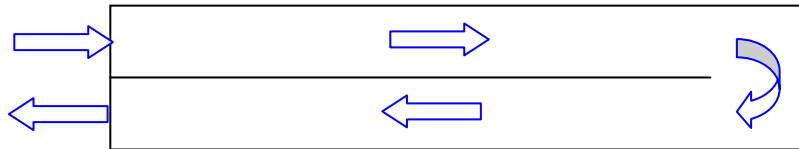
You may collaborate in working on the homework, but the work you submit should be your own. Questions are by design open-ended: you may need to make assumptions or develop your own approach.

Question 1 (10 points total, 2 points each part)

A waste treatment system is to be designed for a raw wastewater containing 200 mg/L of carbonaceous oxygen demanding material (BOD). The wastewater flow rate of 0.2 million gallons per day (mgd) is to be introduced into a reactor tank having a theoretical detention time of 1 day. The organic matter is oxidized at the rate of 1.0 day^{-1} (first-order rate constant). Note that $1 \text{ mgd} = 1.55 \text{ ft}^3/\text{sec}$.

Compare the relative steady-state treatment efficiencies of the following tank configurations all having the same total theoretical detention time:

- a. A fully-mixed circular tank, 80 feet in diameter, with inflow at center and outflow along the perimeter. Specify the tank depth.
- b. A rectangular dispersed-flow tank, 100 feet long and 50 feet wide, containing a central longitudinal baffle. Specify the tank depth.



- c. A dispersed-flow tank of the same shape as in part b, but without the central baffle.



- d. Three fully-mixed circular tanks of equal size in series. Specify the tank diameters and depths.
- e. Which configuration would you recommend and why?