Guidelines for Engineering Homework

General Guidelines for text-based questions
1) All text-based questions - presentation on plain-typing paper is fine. If hand-written, work is to be presented on engineering paper. Typed work for text-based questions is preferred.
2) Identification Information - Name, due date, class, assignment #, etc.
3) Restate questions
4) Keep answers concise
5) Properly constructed paragraphs with heading and subheading, where appropriate
6) General format guidelines:
   a. 1” margins all around
   b. Line spacing - 1.5
   c. 12 point Times Roman font
   d. Proper us of “Headings and Subheading”
7) References – Presented in American Psychological Association (APA) format

General Guidelines for problem-based questions (Particularly Homework’s 2 through 4)
1) Clearly present problem through the Problem Statement.
2) Identify what is Known/Given.
3) What is the problem statement asking to Find.
4) List all Assumptions.
   a. Typical Assumptions to Consider:
      i. Is the temperature constant?
      ii. What order is the reaction?
      iii. Is the system at SS or NonSS?
      iv. What type of reactor have you defined?
      v. Is the pollutant conservative or nonconservative?
      vi. Gains or losses due to things like percolation or evaporation?
      vii. Are the flows and/or concentrations entering and leaving constant?
      viii. Is k considered to be constant?
5) Draw a Diagram of the system (Free Body Diagram (FBD)).
6) Solve the problem in a step-by-step manner.
7) Clearly identify key information by underlining to draw attention.
8) Clearly identify what you are asked to find by boxing the answer.

Detailed Guidelines
A) Problem Solution Procedure
1) Assign a title or heading for your work.
2) State the problem in your own words (briefly and concisely). Indicate the known information and the information/question to be found/solved.
3) When appropriate, include a sketch of the systems to be analyzed (free body diagram, circuit diagram, kinetic diagram, closed system, control volume, etc.). Select and label a coordinate system.

4) State the boundary conditions or label the boundaries. State any constraints on the problem.

5) Give the appropriate mathematical statements of the physical laws that are necessary to solve the problem.

6) List all assumptions.

7) Perform the analysis (algebraically or numerically) to obtain your answer.

8) Identify your answer by boxing it; include the units. Remember the number of significant figures appropriate for your work.

9) Check your answer for reasonableness. Review assumptions. Check consistency of units used.

10) Review your work for common errors such as signs, errors, etc.

B) Be certain your name and due date is included in the heading of your work.

C) Format Requirements
   1) All work is to be done on 8.5 x 11 inch Lafayette College Engineering Paper. If needed, use graph paper. Use only the front side of the paper.
   2) Use pencil (2H or softer) and eraser. Print all words.
   3) Use rulers, straight edges, templates, French curves, protractors, etc. for all drawings, sketches and graphs.
   4) Work sequentially down the page. Do not crowd your work. Be neat, legible and unambiguous.
3. A 4,000-km² watershed receives 102 cm of precipitation in one year. The average flow of the river draining the watershed is 43.2 m³/s. Infiltration is estimated to be $5.5 \times 10^{-7}$ cm/s and evapo-transpiration is estimated to be 40 cm/yr. Determine the change in storage in the watershed over one year. (report your answer as m³) The ratio of runoff (in cm) to precipitation is termed the runoff coefficient. Computer the runoff coefficient for this watershed.

![Diagram](precipitation-102-cm-evaporation-40-cm-yr-watershed-4000-km2-outflow-43.2-m3-s-infiltration-5.5e-7-cm-yr)

**Known:**
- Precipitation $P = 102$ cm/yr
- Evaporation $E = 40$ cm/yr
- Watershed Area $= 4,000$ km²
- Infiltration $I = 5.5 \times 10^{-7}$ cm/yr
- Runoff $= \text{Outflow} = O = 43.2$ m³/s

**Find:**
- a) Change in Storage over one year $= \Delta S/y$
- b) Ratio of runoff (cm) to perception = runoff coefficient

**Assumption:**
No additional reactions, Water activity is as defined...no other source or removals, constant temp.

**Solution:**

\[ \Delta S/y = P - E - I - O \]

\[ \text{Runoff} = O = \frac{\left(43.2 \text{ m}^3/\text{s}\right)\left(86,400 \text{ s/day}\right)\left(365 \text{ d/year}\right)\left(100 \text{ cm/m}\right)}{\left(4,000 \text{ km}^2\right)\left(1 \times 10^6 \text{ m}^2/\text{km}^2\right)} = 34.05 \text{ cm/yr} \]

\[ I = \left(5.5 \times 10^{-7} \text{ cm/s}\right)\left(86,400 \text{ s/day}\right)\left(365 \text{ d/year}\right) = 17.34 \text{ cm/yr} \]
a) \( \Delta S/y = 102 \text{ cm/y} - 40 \text{ cm/y} - 40 \text{ cm/y} - 34.05 \text{ cm/y} = 10.61 \text{ cm/y} \)

OR

\( \Delta S \) for one year reported as Volume (\( \text{m}^3 \)) considering a watershed area of 4,000 \( \text{km}^2 \)

\[
\text{Volume} = (10.61 \text{ cm/y})(1 \text{ y})(10^{-2} \text{ m/cm})(4,000 \text{ km}^2) \left( 1 \times 10^6 \text{ m}^2/\text{km}^2 \right) = 4.2 \times 10^8 \text{ m}^3
\]

b) Runoff coefficient \( C = \frac{\text{runoff}}{\text{precipitation}} = \frac{34.05 \text{ cm}}{102 \text{ cm}} = 0.3333 \text{ or } 33.33\% \)