

Homework #3

Construct an Excel spreadsheet to predict the substrate and biomass concentration for a batch-type bioreactor by the numerical method.

- 1) What are the substrate and biomass concentrations after 0.1 d calculated by setting the following values as Δt ?

i. $\Delta t = 0.0001$ d; ii. $\Delta t = 0.001$ d; iii. $\Delta t = 0.05$ d

- 2) Compare the results for the numerical solution with different Δt values. In your opinion, which will be more accurate? Why? For $\Delta t = 0.05$ d, obtain the solutions for substrate and biomass concentrations at 0.5 d. What do you get?

Use the following parameters:

$$S^0 = 500 \text{ mg COD/L} \quad X_a^0 = 100 \text{ mg VSS/L} \quad \hat{q} = 20 \text{ g VSS/g COD-d}$$

$$K = 100 \text{ mg COD/L} \quad Y = 0.4 \text{ g VSS/g COD} \quad b = 0.1/\text{d}$$

Submit not only your answers but also the Excel spreadsheet you worked on. Grading will be given based on the methodology you used and logics of your answers.

(100 points)