FACULTY OF CHEMICAL AND ENERGY ENGINEERING
UNIVERSITI TEKNOLOGI MALAYSIA

| | |
|---|---|
| SETN 2393 NUMERICAL METHODS FOR NUCLEAR ENGINEERS | Semester I 2022-2023 |
| Project 2 | Due: 8 February 2023 |

In Project 1, we analyzed the steady state of a series of reactors as shown in Figure 1. In addition to steady-state computations, we might also be interested in the transient response of a completely mixed reactor. To do this, we have to develop a mathematical expression for the accumulation term in the conservation of mass. Accumulation represents the change in mass in the reactor per change in time. For a constant-volume system, it can be simply formulated as

$$\text{Accumulation} = V\frac{dc}{dt}$$

For $Q_{01}c_{01} = 50$ mg/min, $Q_{03}c_{03} = 160$ mg/min, $V_1 = 50$ m$^3$, $V_2 = 20$ m$^3$, $V_3 = 40$ m$^3$, $V_4 = 80$ m$^3$, and $V_5 = 100$ m$^3$, $c_{01} = 1$ mg/m$^3$, $c_{03} = 8$ mg/m$^3$, and initial concentration for each tank $c_i(0) = 0$ mg/m$^3$, compute how the concentrations will increase over the next two hours by using numerical methods that you have learned.

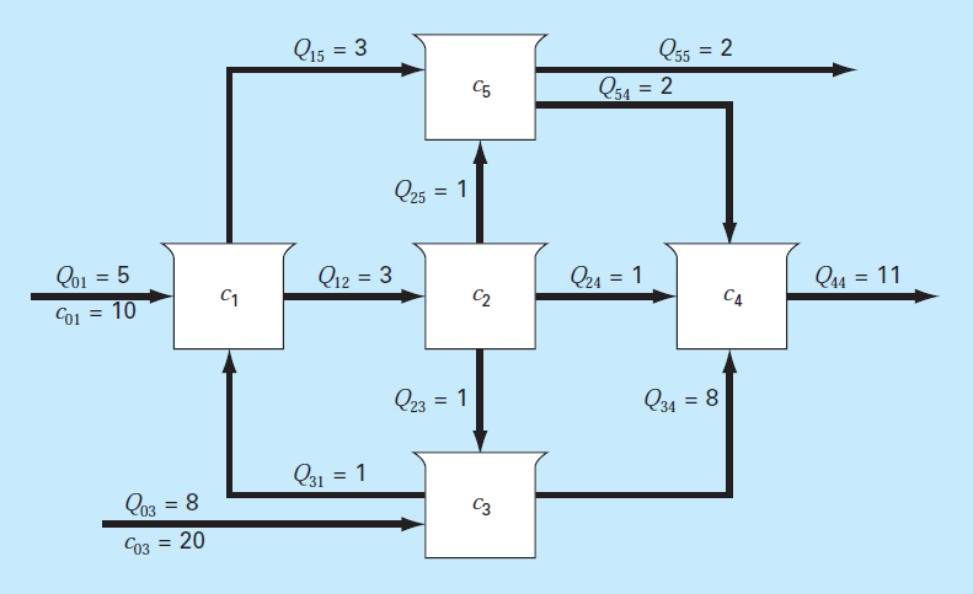


Figure 1 System of networked chemical reactors.

## Deliverables

Your report should include the description of the problem, how you set up the problem, assumptions, method of solution, the Matlab/Octave code that you used, the results, all relevant plots, discussion and potential weaknesses in your solution method. Upload your work to the elearning website in a zip file containing all relevant files.