AFE BABALOLA UNIVERSITY, ADO-EKITI, EKITI STATE, NIGERIA
COLLEGE OF ENGINEERING
DEPARTMENT OF CHEMICAL AND PETROLEUM ENGINEERING

BACHELOR OF ENGINEERING ASSIGNMENT IV

ENG 382: Engineering Mathematics IV

Session: 2019/2020 **Semester:** Second **Unit:** 3 **Duration:** 6 days

Instruction: Answer all the questions.

Question 1 [20 Marks]

The dynamic models of three interconnecting tanks with one inlet and one outlet streams are as given in Equation (1) in terms of oil quantities inside each of them where Q_1, Q_2 and Q_3 are the quantities of the oil in tanks 1, 2 and 3, respectively, at any time *t*.

$$\left\{\begin{aligned}\frac{dQ_1}{dt} &= -\frac{15}{500}Q_1 + \frac{5}{1000}Q_2 + 1 \\ \frac{dQ_2}{dt} &= \frac{15}{500}Q_1 - \frac{18}{1000}Q_2 + \frac{3}{400}Q_3 \\ \frac{dQ_3}{dt} &= \frac{13}{1000}Q_2 - \frac{13}{400}Q_3\end{aligned}\right\} \quad (1)$$

If at time $t = 0$, $Q_1 = Q_2 = Q_3 = 0$ Litre, taking the simulation period to be $0 \le t \le 1200$ min with $\Delta t = 1$min , write a MATLAB *mfile* program to plot the dynamic responses of the tanks to be as shown in Figure 1.

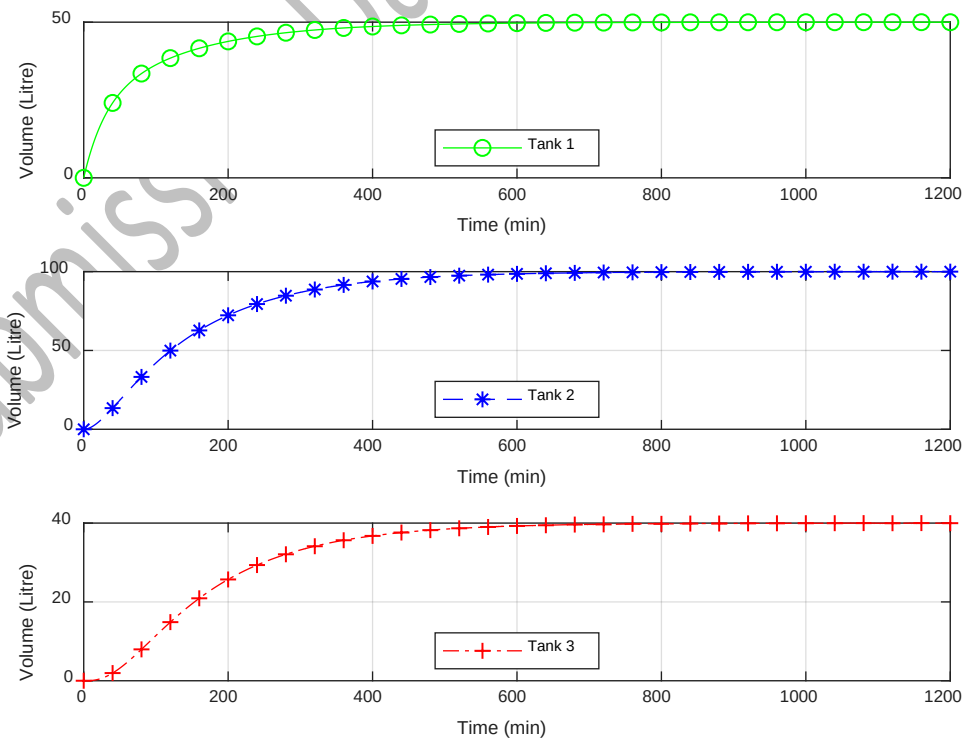

Figure 1: Dynamic responses of the tanks