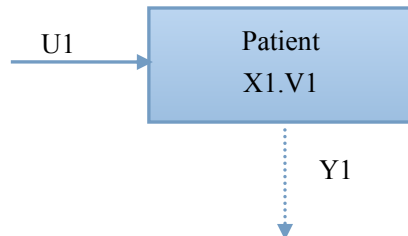


Practice 8

Nian.Liu

Practice 8_1

- Block diagram of the model



- Definition equation model

$$\dot{X}_1 = U_1 - K \cdot X_1$$

$$\dot{Y}_1 = \frac{X_1}{V_1}$$

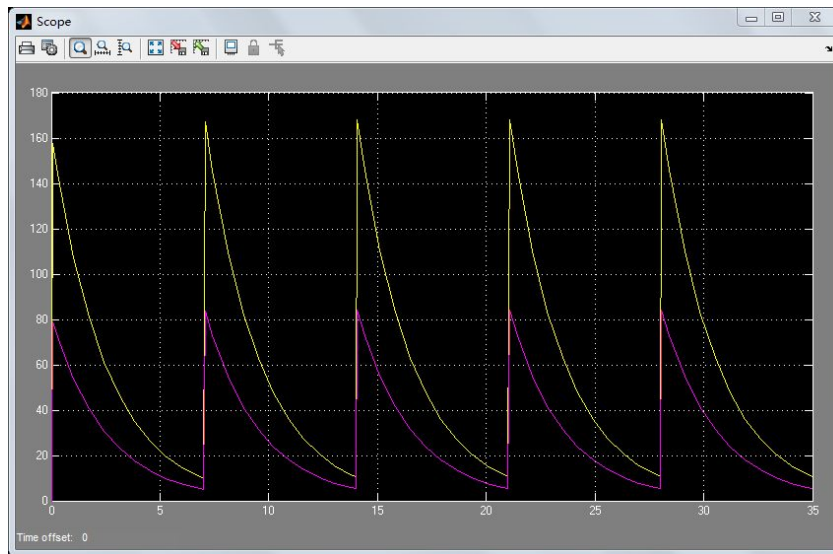
- Table of all state variables of the model with columns

X1	Y1
Drug vancomycin	Concentration of drug
$X1(0) = 0$	$Y1(0) = 0$
mg	Mg/l

- Table of all model parameters:

U1	K	V1
First dose	/.	Volume
400	0.4	5
mg	/hod	L

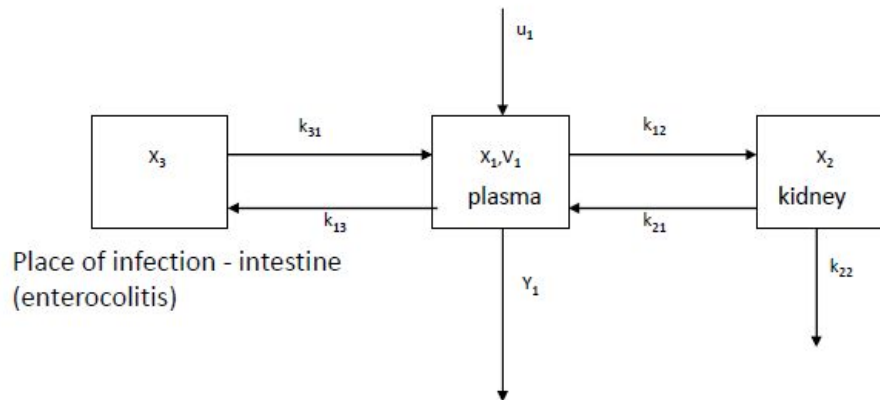
- Graphical output of simulations results



concentration of the drug after 35 hours:10.51 mg/l

Practice 8_2

● Block diagram of the model



● Definition equation model

$$Q'_k(t) = \sum_{i=1}^n k_{iq(k)} u_i(t) + \sum_{\substack{j=1 \\ j \neq k}}^k k_{jk} Q_j(t) - \sum_{\substack{j=1 \\ j \neq k}}^k k_{kj} Q_k(t) - \sum_{i=1}^m k_{q(k)i} Q_k(t)$$

$$\dot{X}_1 = U_1 + K_{21} \cdot X_2 + K_{31} \cdot X_3 - (K_{12} + K_{13}) \cdot X_1$$

$$\dot{X}_2 = X_1 \cdot K_{12} - (K_{21} + K_{22}) \cdot X_2$$

$$\dot{X}_3 = X_1 \cdot K_{13} - X_3 \cdot K_{31}$$

- **Matrix A,B,C and D**

$$A = \begin{pmatrix} -0.9 & 0.2 & 0.7 \\ 0.6 & -1 & 0 \\ 0.3 & 0 & -0.7 \end{pmatrix} \quad B = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} \quad C = \begin{pmatrix} 0.2 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix} \quad D = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$$

- **Table of all state variables of the model with columns**

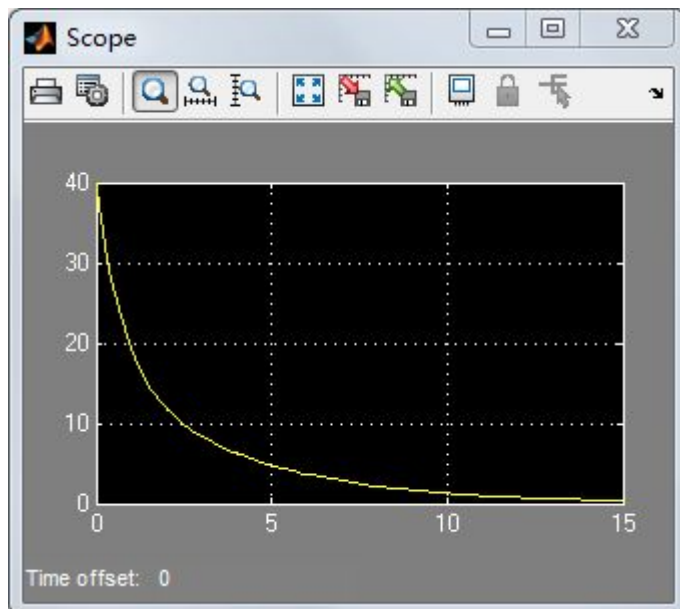
X1	X2	X3	Y1
Plasma	Kidney	Place of infection	Concentration of drug
0	0	0	0
mg	mg	mg	mg/l

- **Table of all model parameters:**

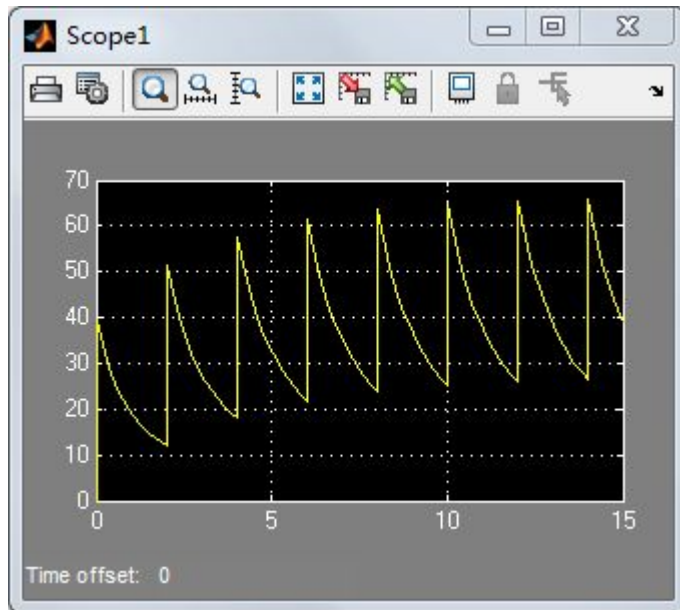
U1	K12	K13	K21	K22	K31	V1
First dose	/.	/.	/.	/.	/.	Volume
/.	0.6	0.3	0.2	0.8	0.7	5
mg	L/H	L/H	L/H	L/H	L/H	L

- **Graphical output of simulations results**

1)single infusion of 200mg vancomycin



2)Periodic dosage of 200mg of vancomycin at intervals of 2 hours



3) Periodic dosage of 200mg of vancomycin at intervals of 2 hours with an initial bolus of 400 mg

