哈尔滨工业大学（深圳）

《系统建模与仿真》课程
实验报告

（2020-2021 秋季学期）

课程名称 ： 系统建模与仿真

题　　目 ： **simulink 仿真**

班级学号 ： **19 级自动化 1 班 190410102**

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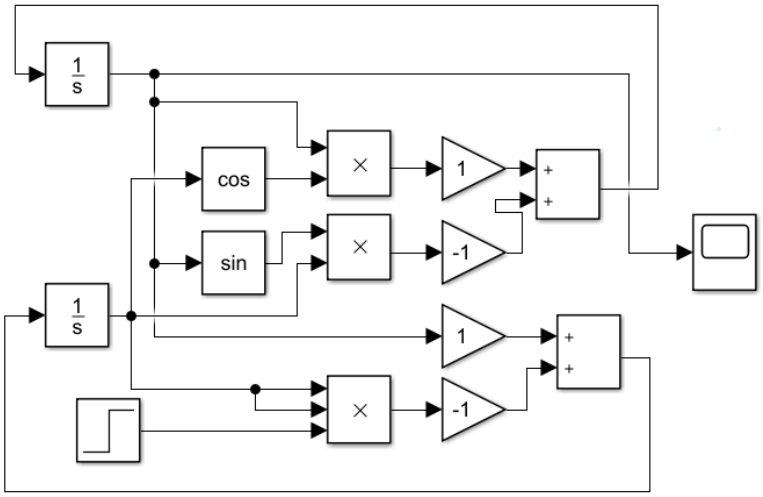
2020 年 10 月 29 日

[例 12]　(3)试用 Simulink 建立一个如下图所示的非线性控制系统模型。

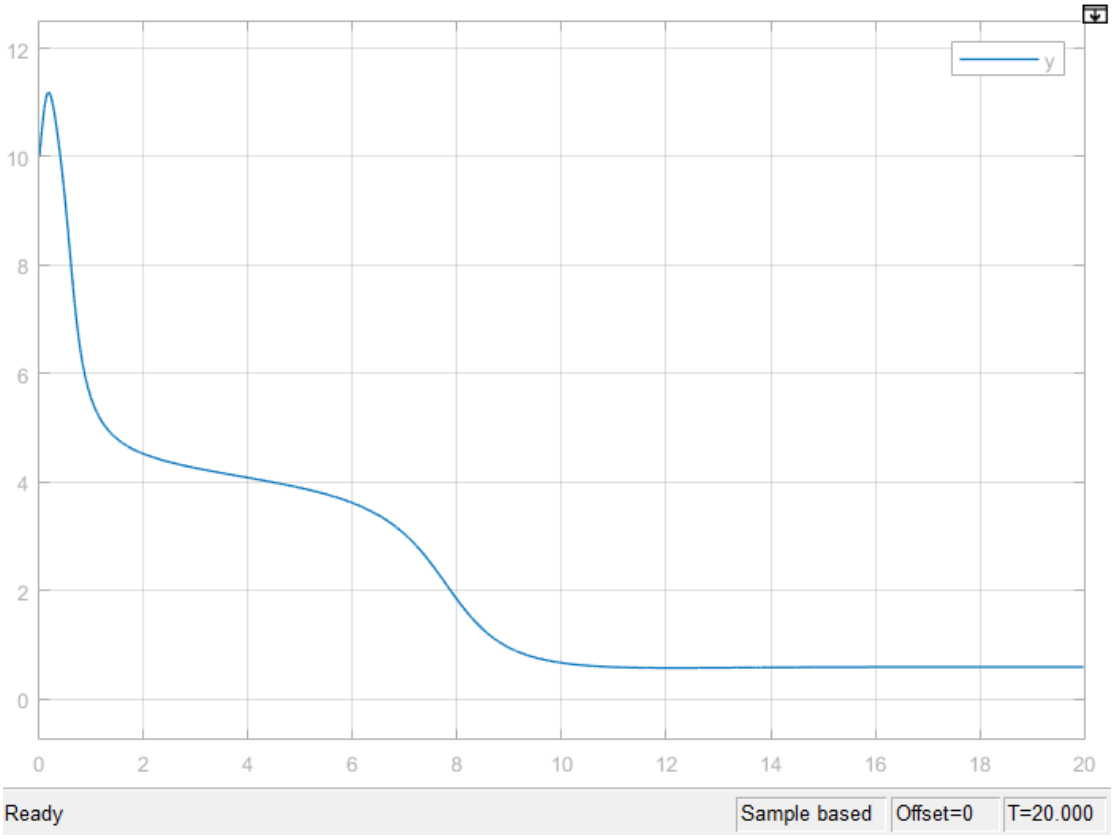
$$\begin{cases} \dot{x}_1 = x_1 \cos x_2 - x_2 \sin x_1 \\ \dot{x}_2 = x_1 - x_2^2 u \\ y = x_1 \end{cases}$$

设定初值 $x_1(0) = 10;\ x_2(0) = 0;$

Simulink 仿真文件截图如下：



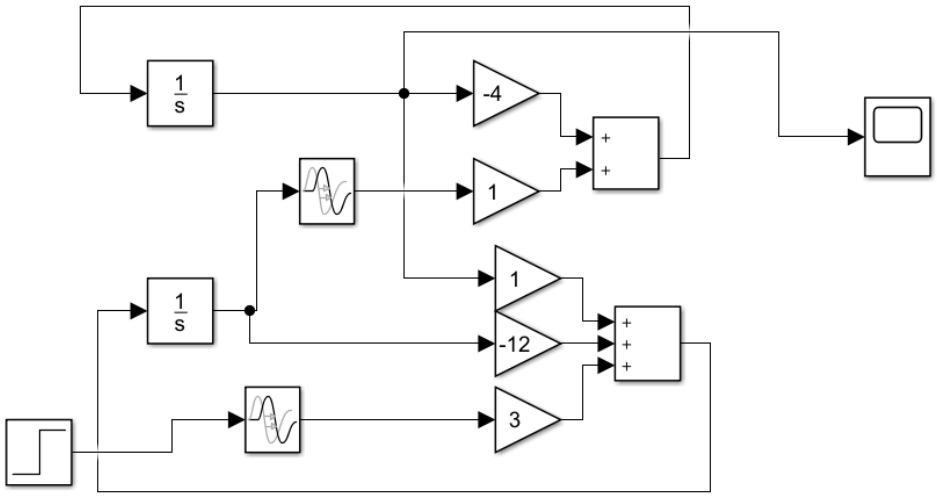
仿真结果如下：



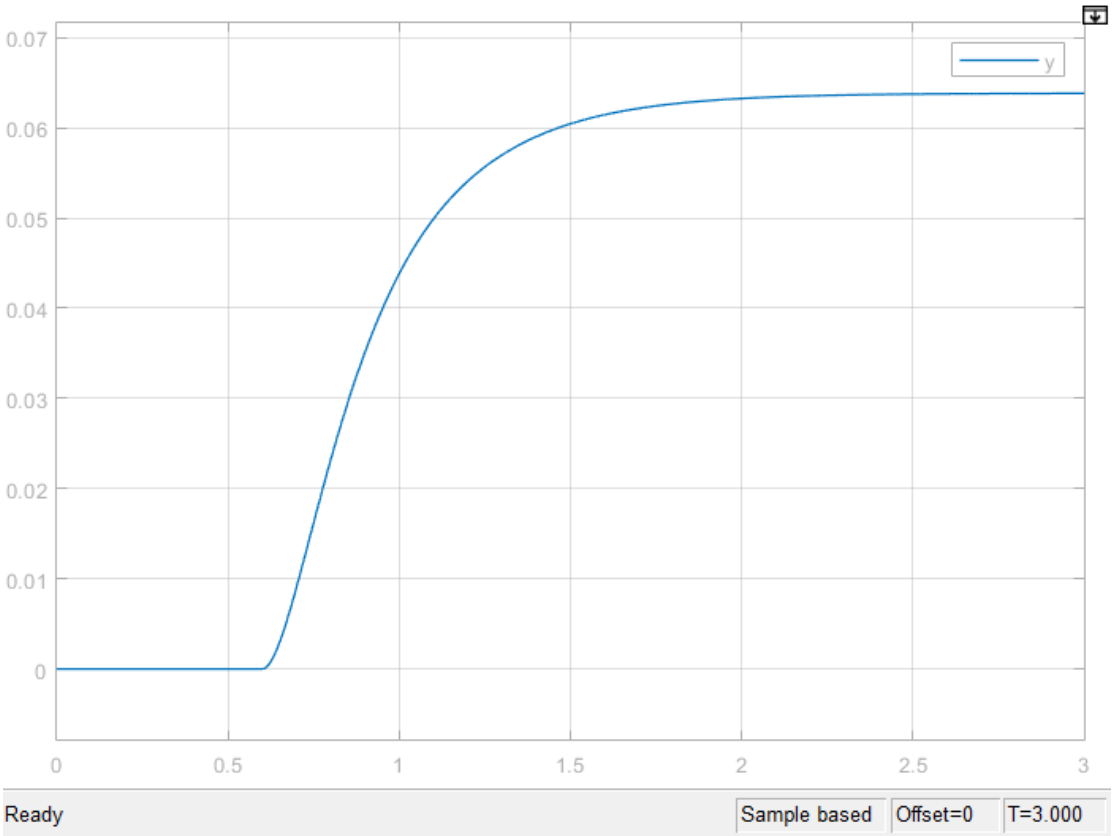
[例 13] **(4)试用 Simulink 建立一个如下图所示的线性时滞控制系统模型，并考察其单位阶跃响应。**

$$\begin{cases} \dot{x}_1(t) = -4x_1(t) + x_2(t-0.4) \\ \dot{x}_2(t) = x_1(t) - 12x_2(t) + 3u(t-0.2) \\ y(t) = x_1(t) \end{cases}$$

Simulink 仿真文件截图如下：



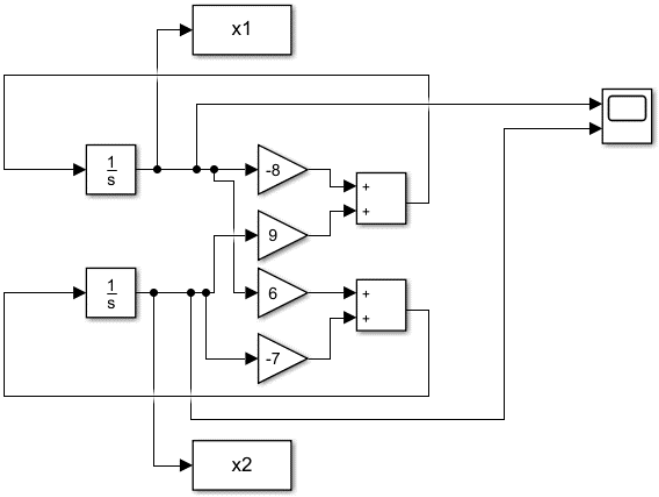
仿真结果如下：



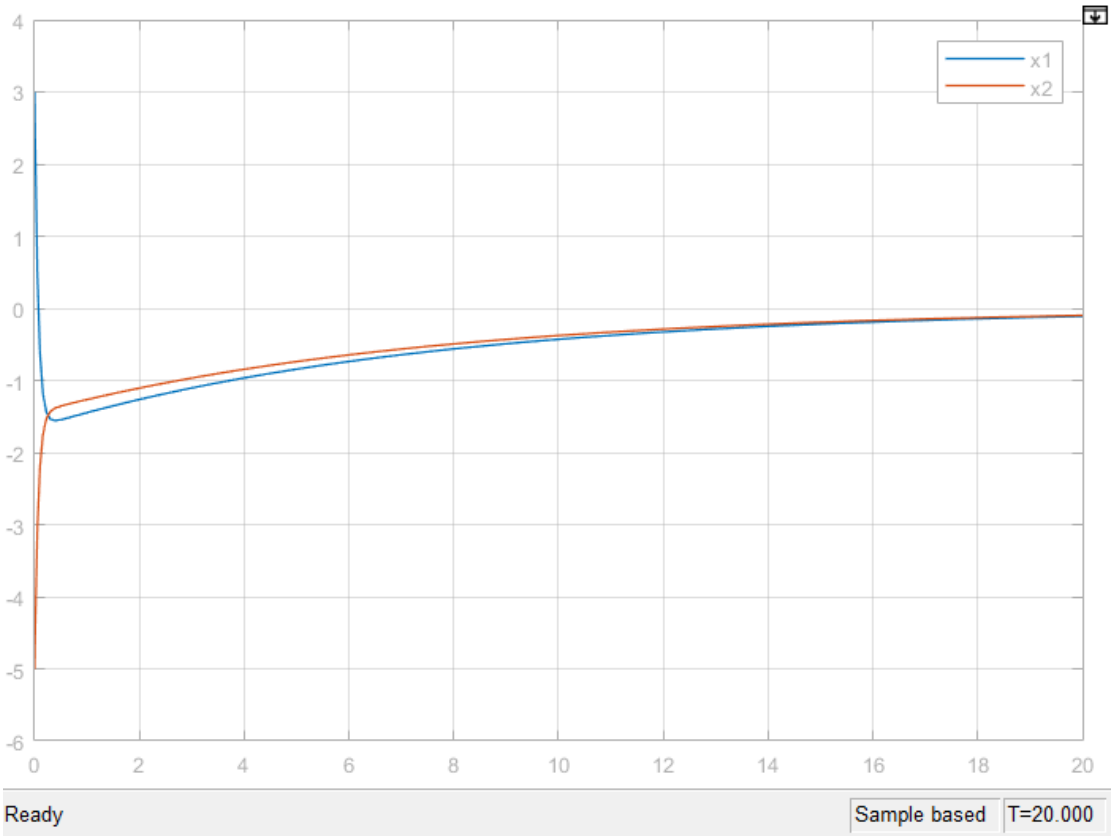
[例 15] 利用 Simulink 工具画出下列系统在闭环状态反馈情况下的的状态响应轨线。

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\end{bmatrix}=\begin{bmatrix}-8 & 9\\ 7 & -5\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u,\quad \begin{bmatrix}x_1(0)\\ x_2(0)\end{bmatrix}=\begin{bmatrix}3\\ -5\end{bmatrix},\quad u=\begin{bmatrix}-1 & -2\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$$

Simulink 仿真文件截图如下：



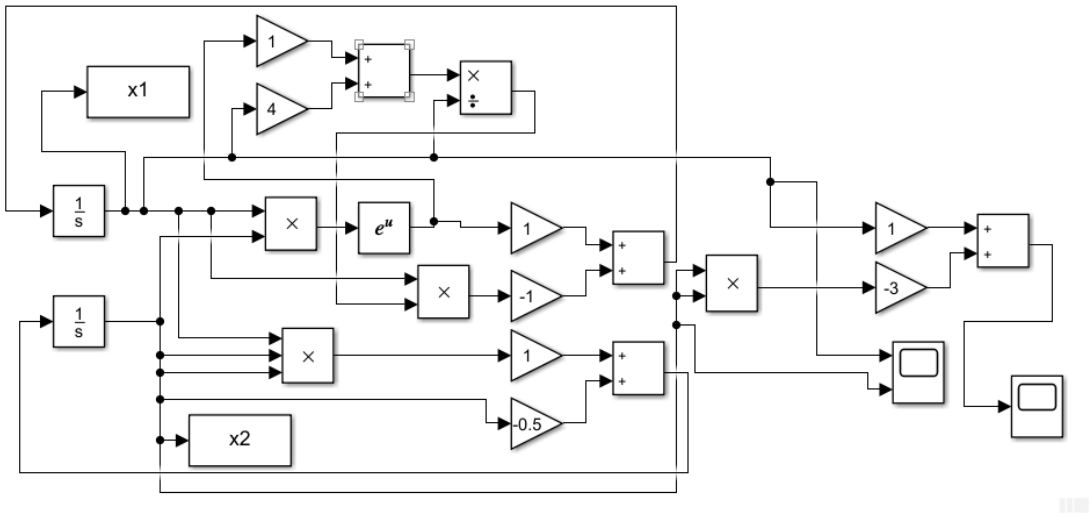
仿真结果如下：



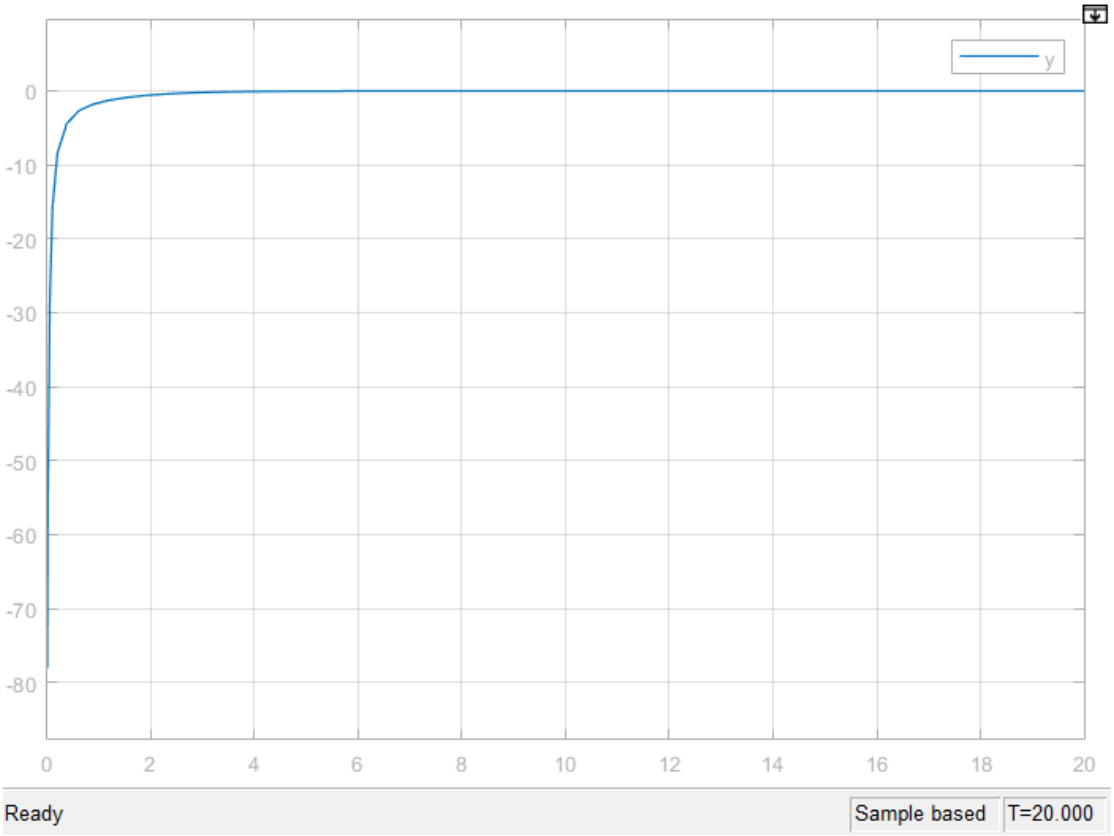
[例 16]利用 Simulink 工具画出下列系统在闭环状态反馈情况下的输出响应轨线。

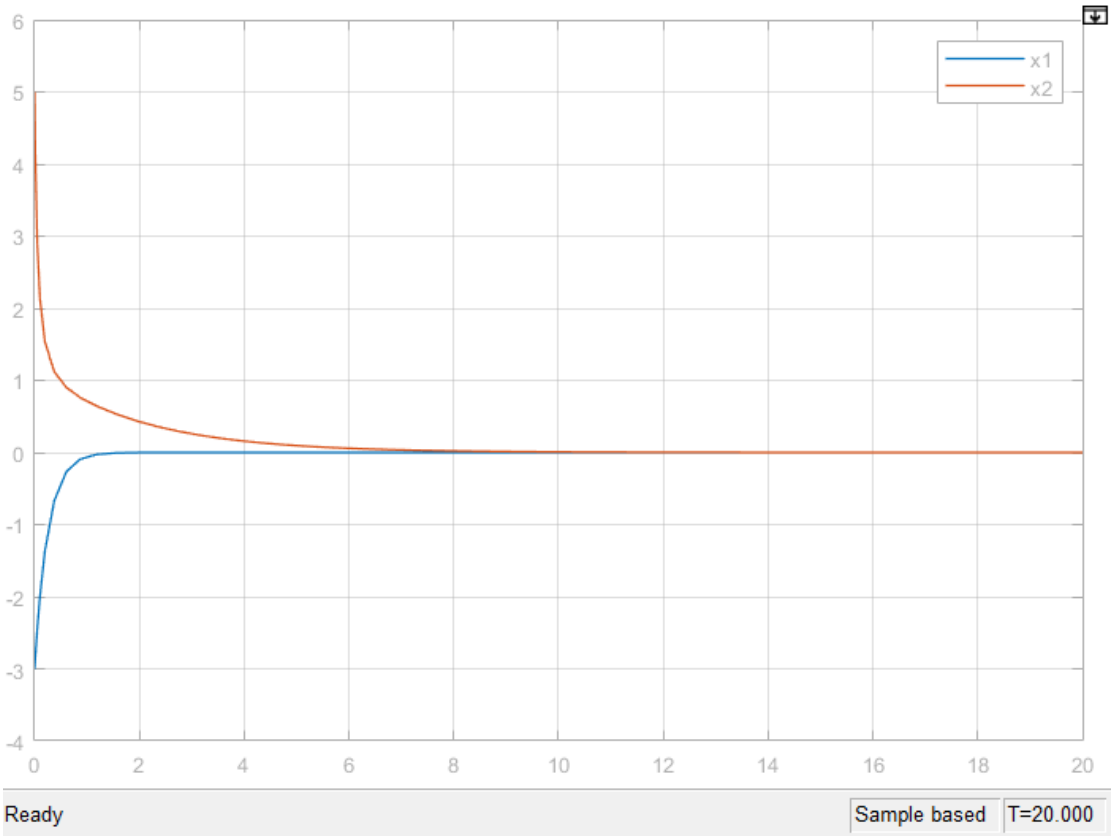
$$\begin{cases}\dot{x}_1 = e^{x_1 x_2} - x_1 u \\ \dot{x}_2 = x_1 x_2^2 - \dfrac{1}{2} x_2\end{cases}, \quad \begin{cases}x_1(0) = -3 \\ x_2(0) = 5\end{cases}, \quad u = \frac{e^{x_1 x_2} + 4x_1}{x_1}, \quad y = x_1 - 3x_2^2$$

Simulink 仿真文件截图如下：



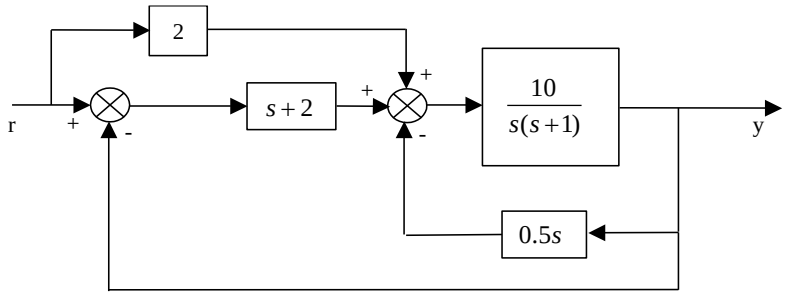
仿真结果如下：



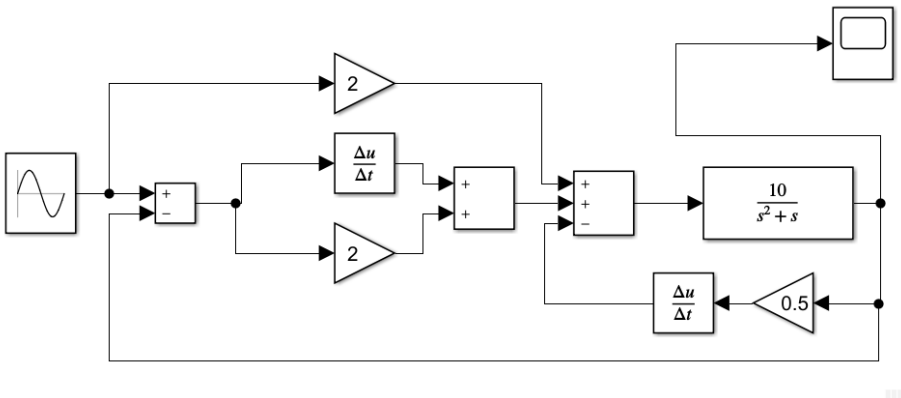


[例 17]利用 Simulink 工具画出下面方块图所示系统的输出响应轨线。

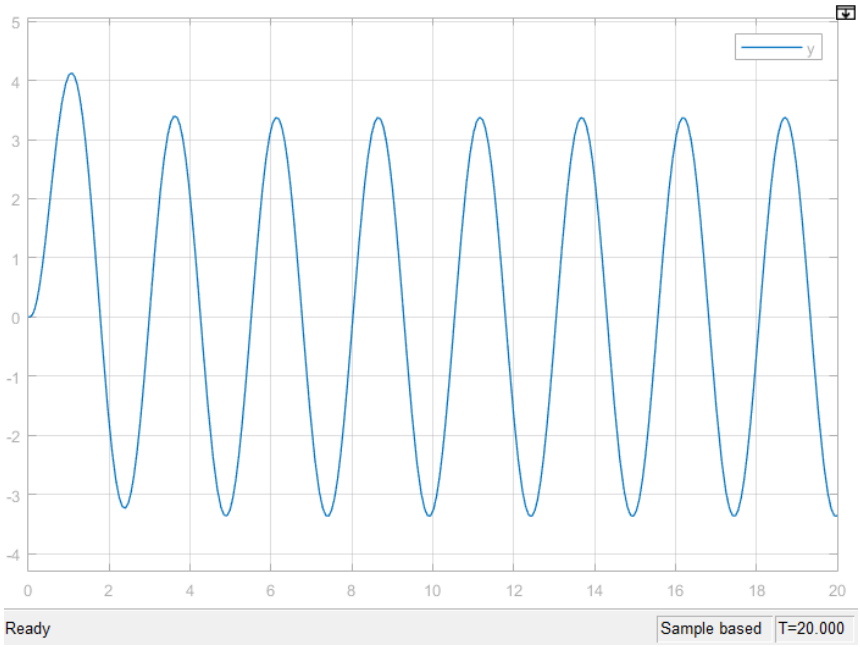
其中输入信号取为： $r(t)=3\sin(2.5t-0.56)$



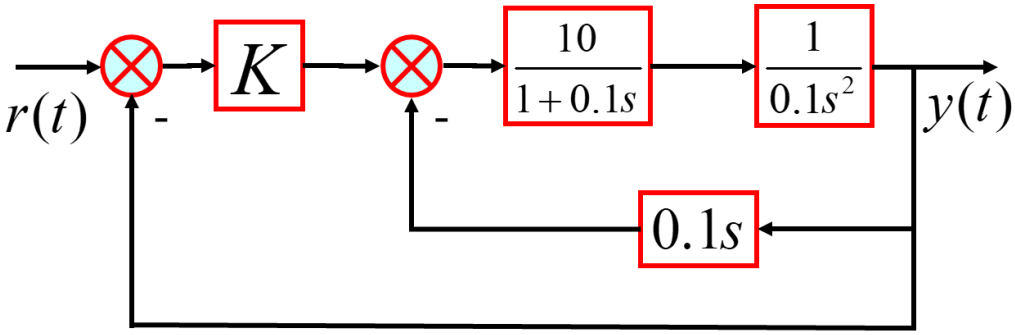
Simulink 仿真文件截图如下：



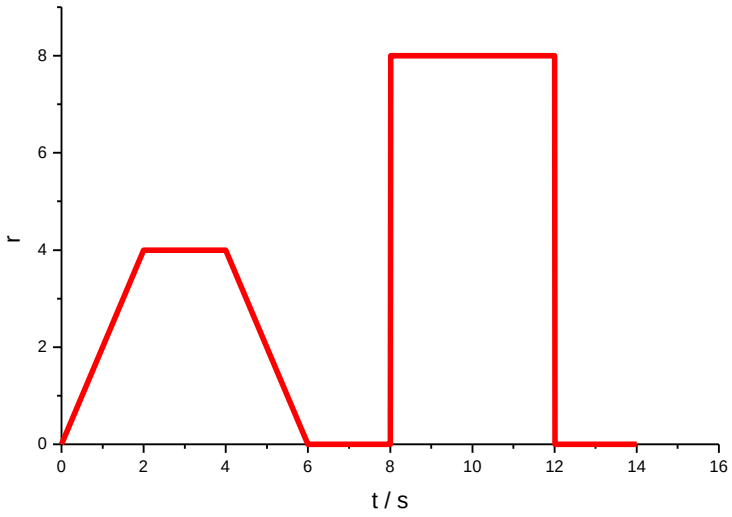
仿真结果如下：



[例 19] 给定直流电机控制系统框图如下：

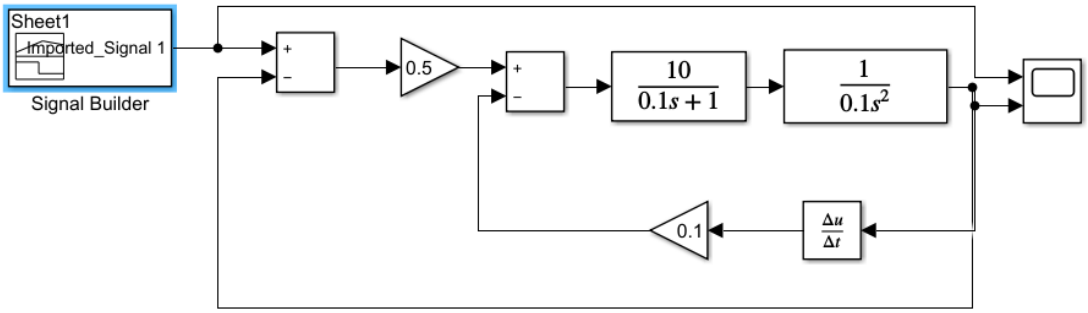


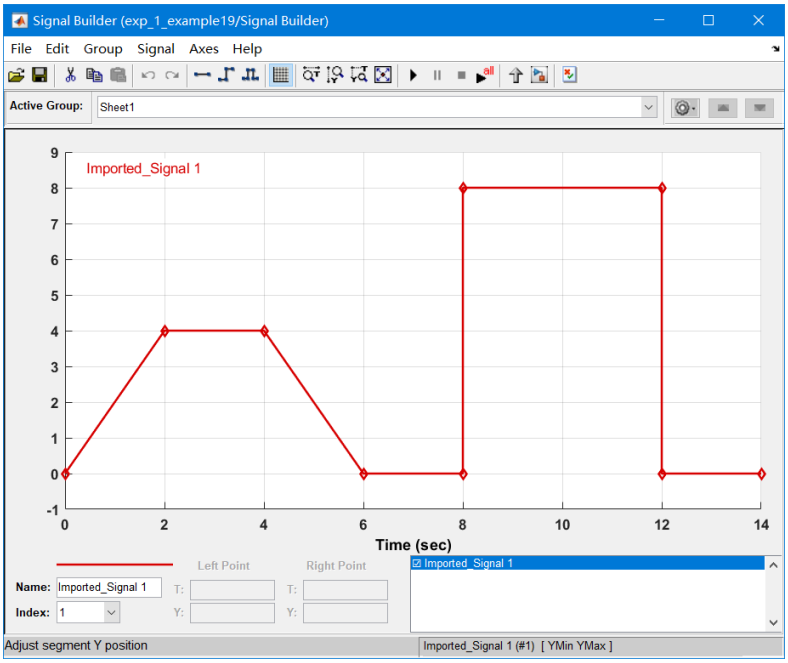
给定输入信号：



在不同 K 下，求 K 对系统性能的影响。

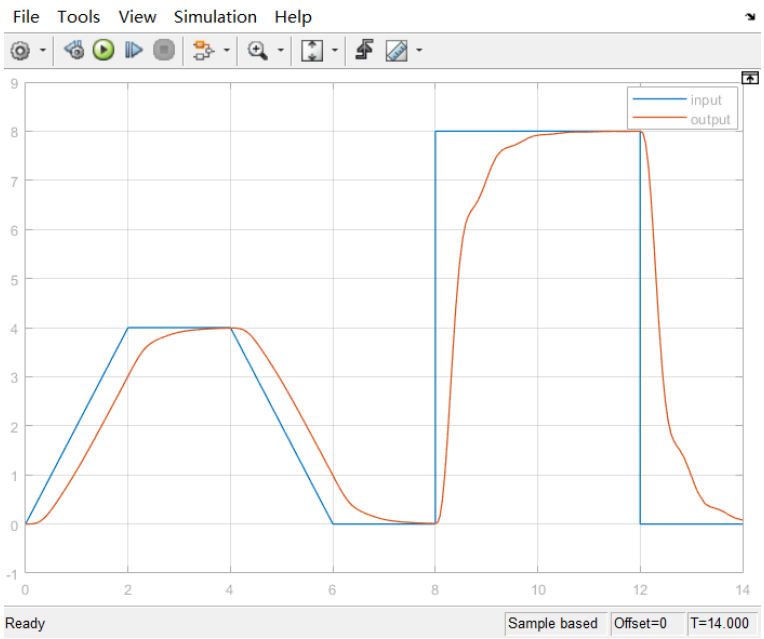
Simulink 仿真文件截图如下：



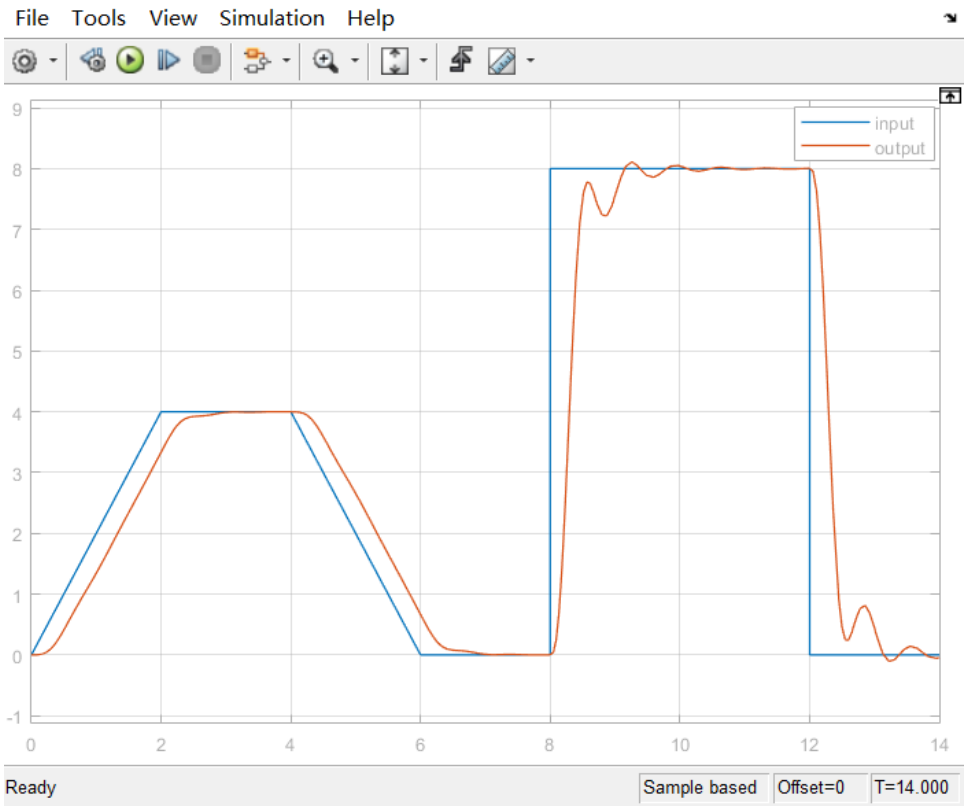


仿真结果如下：

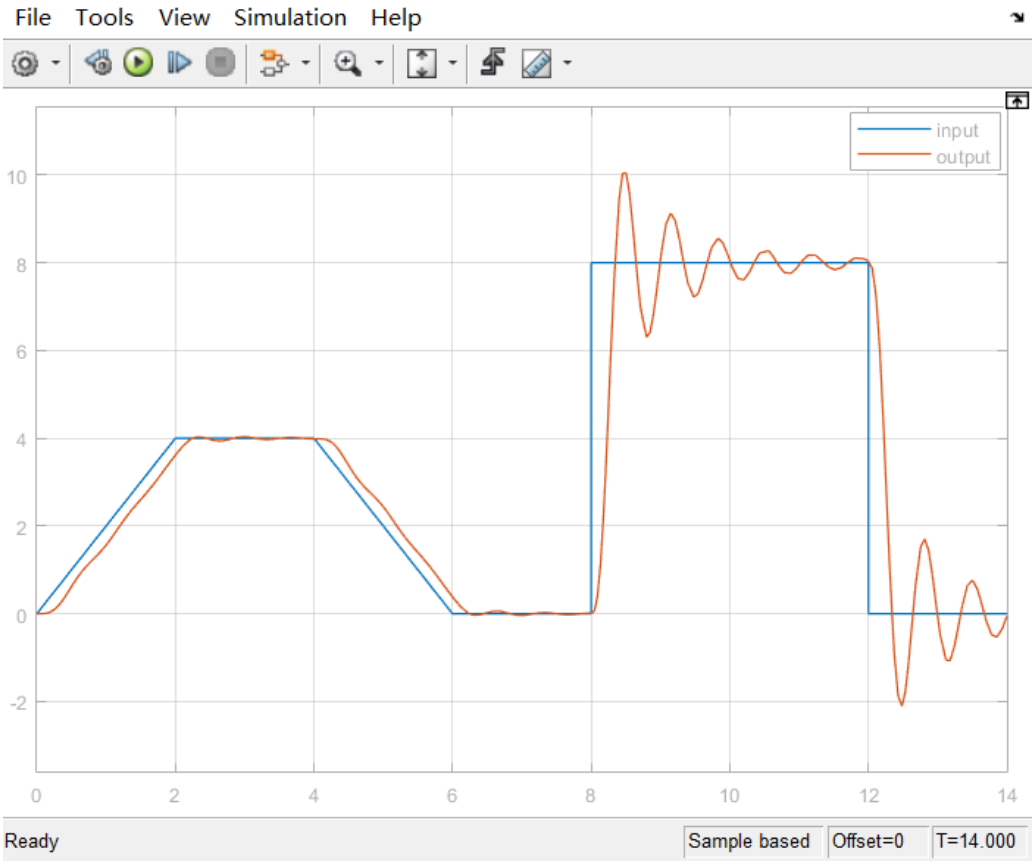
K=0.2:



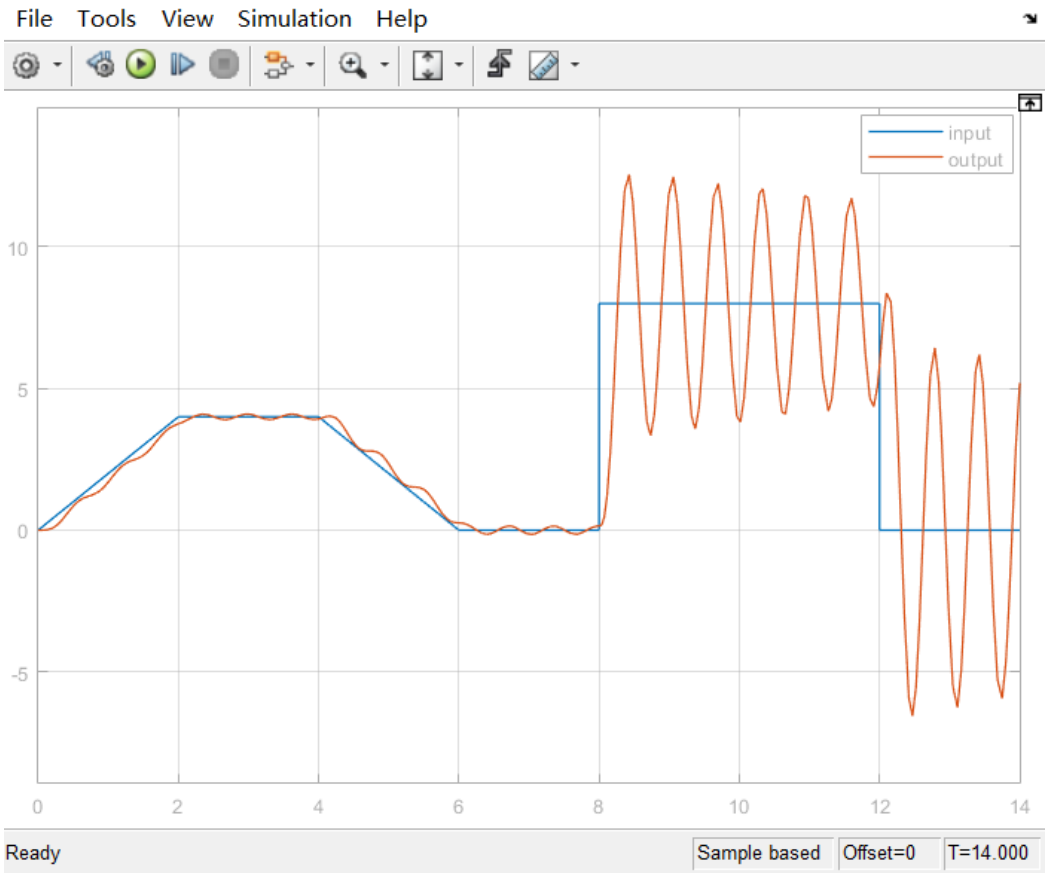
K=0.3:


File Tools View Simulation Help
input
output
Ready
Sample based
Offset=0
T=14.000

K=0.5:


File Tools View Simulation Help
input
output
Ready
Sample based
Offset=0
T=14.000

K=0.8:


File Tools View Simulation Help
input
output
10
5
0
-5
0
2
4
6
8
10
12
14
Ready
Sample based
Offset=0
T=14.000