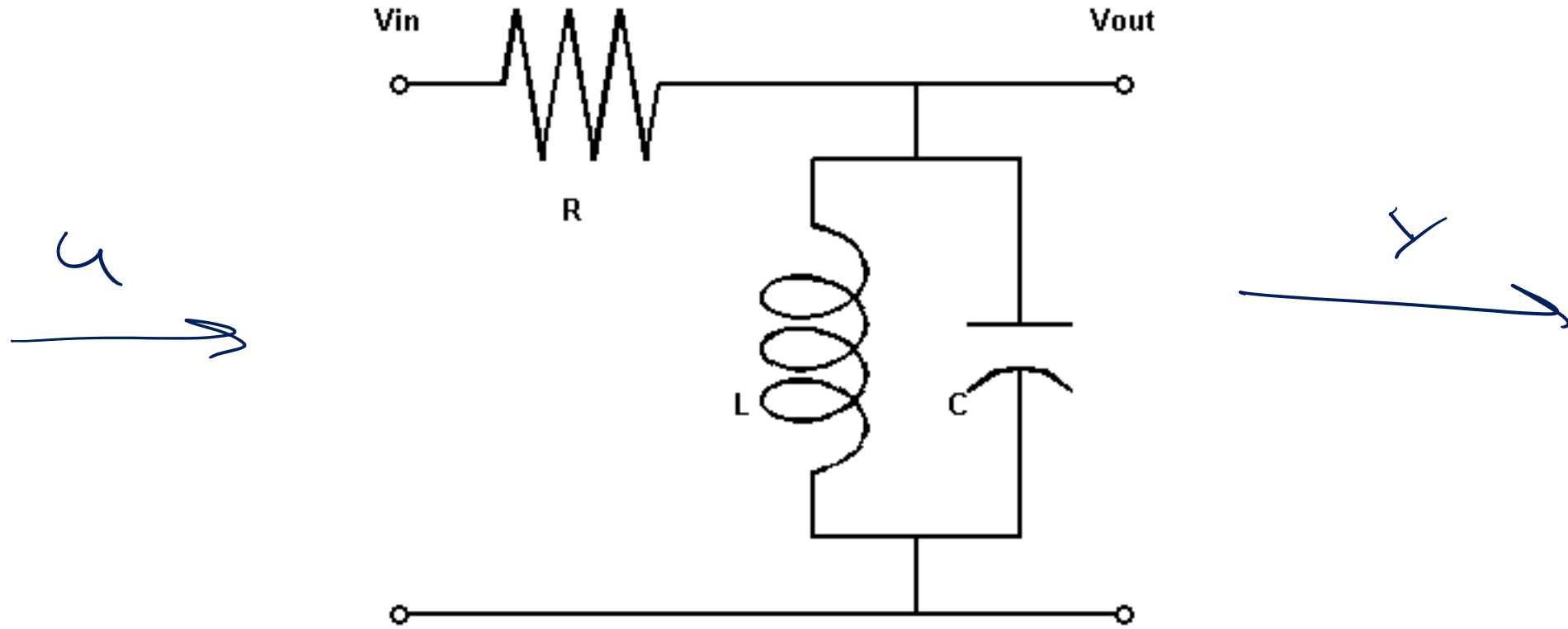


AIM OF TUTORIAL (OUTPUT ERRORS FOR DET. CONT. TIME SYSTEM).

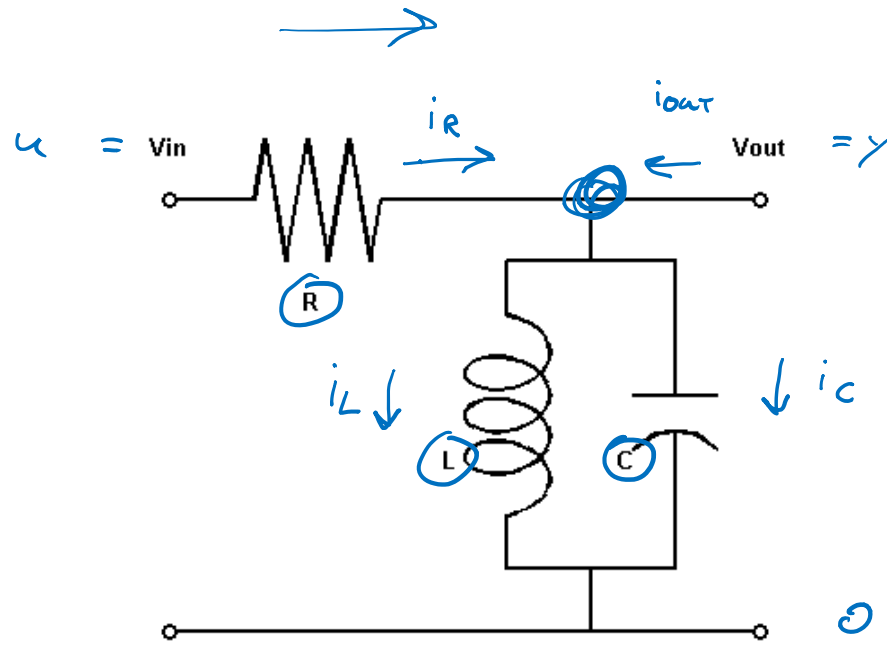
GIVEN: 1) SYSTEM STRUCTURE



2) DATA: $\Delta t = 10^{-5}$ $N = 1000$

u
 y

STEP ONE: MODEL SYSTEM



$$i_R + i_{out} = i_L + i_C$$

$$i_{out} = 0$$

$$i_R = i_L + i_C$$

$$R i_L + R C \cdot \dot{y} = -y + u$$

$$R \frac{di_L}{dt} + R C \cdot \dot{y} = -y + u$$

$$R i_L + R i_C = -y + u$$

$$\ddot{y} + a_1 \dot{y} + a_0 \cdot y = b_0 \cdot u + b_1 \dot{u} + b_2 \ddot{u}$$

$$R i_R = -y + u$$

$$L \frac{di_L}{dt} = y$$

$$i_C = \dot{y} \cdot C$$

$$R \cdot i_R = -(y - u)$$

$$L \frac{d}{dt}(i_L) = -(0 - y) = y$$

$$i_C = -\frac{d}{dt} \int (0 - y) C = \dot{y} \cdot C$$

$$R C \cdot \ddot{y} + \dot{y} + \left(\frac{R}{L}\right) y = \dot{u}$$

$$\frac{R}{L} y + R C \cdot \dot{y} = -\dot{y} + \dot{u}$$

$$a \dot{y} + y + b \dot{u} = \dot{u}$$

ONLY TWO PARAMS CAN BE IDENTIFIED!

$$a = R C$$

$$b = \frac{R}{L}$$

$$[a] = s \quad [b] = \frac{1}{s}$$

$$a \ddot{y} + \dot{y} + by = u$$

$$as^2 Y + sY + bY = sU$$

$$\frac{Y}{U} = \frac{s}{\underline{as^2 + s + b}} = G(s)$$

START SIMULATION IN MATLAB

$$a = \frac{\pi}{3}, \quad b = 2$$

POLES OF SYSTEM ?

$$as^2 + s + b = 0$$

$$s^2 + \frac{1}{a}s + \frac{b}{a} = 0$$

$$s_{1,2} = -\frac{1}{2} \frac{1}{a} \pm \sqrt{\underbrace{\frac{1}{4a^2} - \frac{b}{a}}_{\text{NEGATIVE}}} = \text{OSCILLATION}$$