

淡江大學 95 學年度碩士班招生考試試題

系別：電機工程學系控制晶片與系統組
電機工程學系機器人工程碩士班

科目：控制系統

準帶項目請打「V」

V 簡易型計算機

本試題共 1 頁

1. Consider the electrical circuit in Figure 1:

- (1) Find the transfer function from the input voltage $v(t)$ to the current $i_R(t)$ through the resistor. (10%)
- (2) Find the condition involving the component values of the resistor R , the inductor L , and the capacitor C such that the electrical circuit is underdamped. (10%)
- (3) Suppose that $R = 1000\Omega$. Find the component values of the inductor L and the capacitor C such that the poles of the electrical circuit will be located at $-5000 \pm j$. (10%)

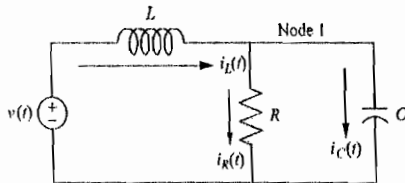


Figure 1

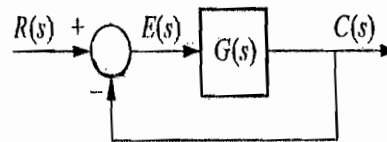


Figure 2

2. Consider a system represented by the following differential equation:

$$\frac{d^2 y}{dt^2} + 3 \frac{dy}{dt} + 2y = \frac{du}{dt} \quad \text{where } u \text{ and } y \text{ denote the input and output, respectively.}$$

- (1) Find a state space representation for the system. (10%)
- (2) Assume $u(t) = \sin(t)$ and zero initial condition (i.e., $y(0) = \frac{dy}{dt}(0) = 0$), find the output $y(t)$. (20%)

3. Consider the unity feedback system in Figure 2 where $G(s) = \frac{K}{(s+a)(s+b)}$. Find K , a , and b to meet the following requirements: the steady-state output value for a unit step input equals 0.1; settling time = 0.8 second; natural frequency = $\sqrt{10}$. (20%)

4. Consider the unity feedback system in Figure 2 where $G(s) = \frac{K(s+20)}{s(s+2)(s+3)}$.

- (1) Find the range of K to make the feedback system stable. (10%)
- (2) Find the frequency of oscillation when K is set to the value that makes the feedback system oscillate. (10%)