

國立臺北科技大學 105 學年度碩士班招生考試

系所組別：1302 車輛工程系碩士班

第三節 自動控制 試題 (選考)

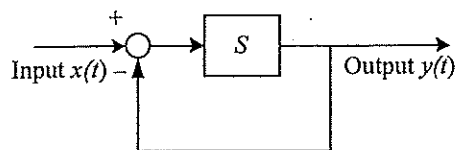
第一頁 共二頁

注意事項：

1. 本試題共 6 題，總共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (15%) The input-output relationship of a LTI system is defined by the differential equation $y''(t) + 2y'(t) + y(t) = x(t)$.
 - (a) Please determine the impulse response of the system (7%)
 - (b) Please determine the step response of the system (8%)

2. (20%) Considering the system diagram as shown below. The system S is a single-input single-output LTI system with the impulse response $(2+t)e^{-t} \cdot u(t)$.
 - (a) Please determine the impulse response of the closed-loop system (10%)
 - (b) Please determine the transfer function of the closed-loop system (10%)



3. (15%) Block diagram of a system is shown in Figure (1), and now representing the system in the form as given in Figure (2) and Figure (3).

- (a) Determine $H(s)$ (5%)
- (b) Determine $C(s)/R(s)$ (5%)
- (c) Determine $G(s)$ (5%)

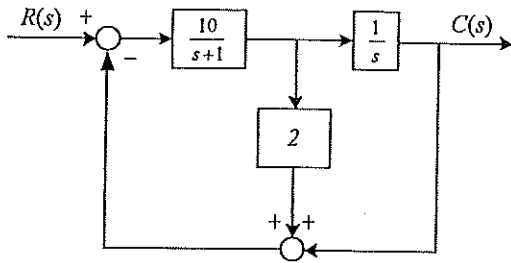


Figure (1)

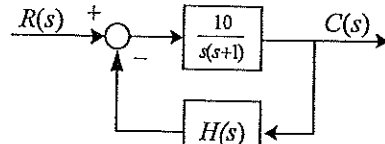


Figure (2)

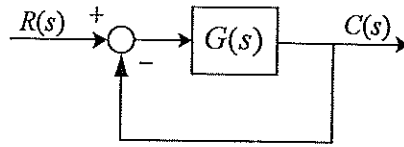
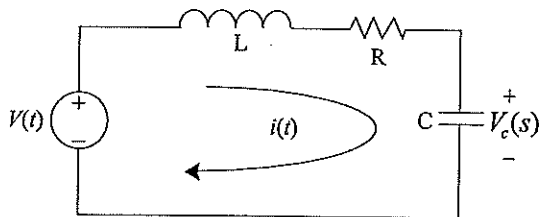


Figure (3)

4. (10%) Find the transfer function relating capacitor voltage to the input voltage $\frac{V_c(s)}{V(s)}$.

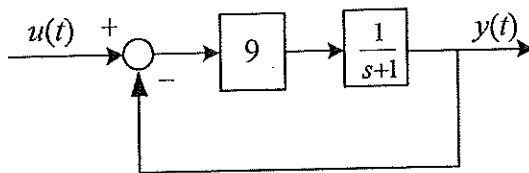


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5. (20%) The open loop transfer function of a system is $G(s) = \frac{K}{s(s+2)(s+5)}$.

- (a) Find the range of K where the system is stable (10%)
- (b) If $K=20$, find the gain margin of the system (10%)

6. (20%) Consider the system shown in the following figure with a unit step input.



- (a) Calculate the steady-state output error, e_{ss} (5%)
- (b) Calculate the maximum overshoot, %OS (5%)
- (c) State the definition of the delay time t_d of the closed-loop system (5%)
- (d) Calculate the delay time of the system, t_d (5%)