國立臺北科技大學 103 學年度碩士班招生考試

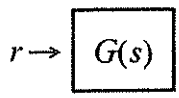
系所組別：1512 自動化科技研究所甲組

第三節　自動控制　試題（選考）

注意事項：

1. 本試題共 6 題，配分共 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 overall transfer function of a system is



$$G(s)=\frac{s+3}{(s+2)(s^2+2s+2)}$$

Find the impulse response of this system.

2. (25%) Suppose a linear time-invariant system with input $u(t)$ and output $y(t)$ has an impulse response

$$h(t)=2e^{-t}\sin t,\ t\geq 0$$

(a) Compute the step response of the system. (10%)

(b) Suppose it is desired to have the output as

$$y(t)=1-2e^{-t}+e^{-2t},\ t\geq 0$$

What is the corresponding input $u(t)$ should be? (15%)

3. (15%) Sketch the approximate Bode plots (both magnitude plot and phase plot) of the following transfer function:

$$G(s)=\frac{s}{(1+0.1s)(1+0.01s)}$$

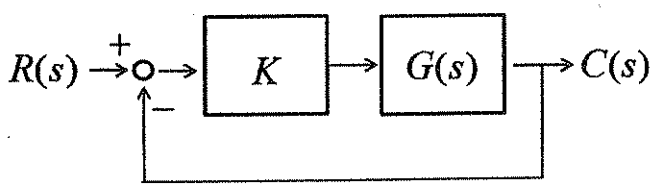
4. (15%) For a unity feedback system with controller $C(s)=K$ and

$$G(s)=\frac{2}{s(s+1)(s+2)}$$

(a) Determine $\angle G(jw)$ at $w=0^{+}$. (7%)

(b) Determine $\angle G(jw)$ at $w\to\infty$. (8%)

5. (10%) Consider the following feedback control system with the characteristic equation: $s^2+(K+1)s+(2K-12)=0$



Determine the system transfer function $G(s)$.

6. (20%) Sketch the root locus with respect to K for the characteristic equation $1+KG(s)=0$, where

$$G(s)=\frac{1}{s(s+2)(s^2+2s+2)}$$