國立臺北科技大學 105 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
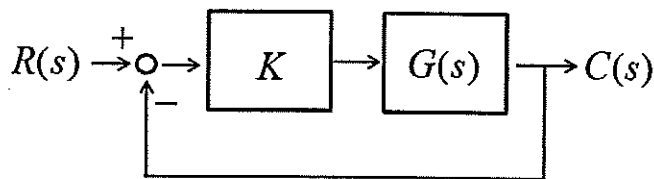
第三節　自動控制　試題　（選考）

1. (10%) Consider the following feedback control system with the characteristic equation: $s^3 + 2s^2 + Ks + 4K = 0$

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

2. (10%) For a unity feedback system with controller $C(s) = K$ and
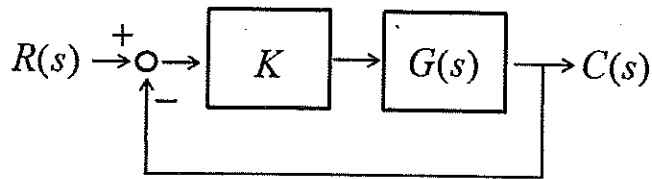
$$G(s) = \frac{1}{s(s+2)(s+5)(s+10)}$$

Determine $\angle G(jw)$ at $w = 0^+$.

3. (15%) Suppose a linear time-invariant system with input $u(t)$ and output $y(t)$ has an impulse response
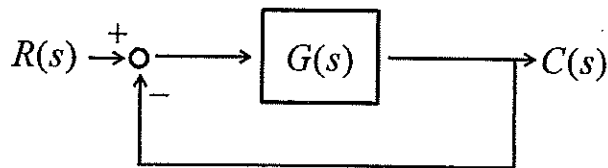
$$h(t) = 5te^{-t}, \ t \geq 0$$

Compute the step response of the system.

4. (25%) Consider the following system, where $G(s) = \dfrac{2(s+1)}{s^2(s+100)}$

R(s) $\xrightarrow{+}$ ⊙ → | K | → | G(s) | → C(s)

(a) Calculate the characteristic equation. (5%)

(b) Estimate all control gains that achieve $\xi = 0.707$ with unit feedback. (20%)

5. (30%) Consider the following system with unity feedback, where $G(s) = \dfrac{10}{s^2 + 14s + 50}$

R(s) $\xrightarrow{+}$ ⊙ → | G(s) | → C(s)

(a) Calculate the steady state error for a step input (15%)

(b) Calculate the steady state error for a ramp input (15%)

6. (10%) Sketch the Bode plots of the following transfer function: $G(s) = \dfrac{1000s}{s^2 + 110s + 1000}$