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國立臺北科技大學 106 學年度碩士班招生考試

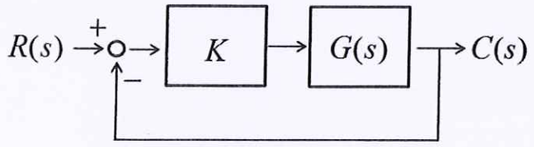
系所組別：1502 自動化科技研究所

第二節　自動控制　試題　（選考）

注意事項：

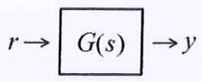
1. 本試題共五題，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. (10%) Consider the following system, where $G(s)=\dfrac{3(s+1)}{s^2(s+10)}$



Calculate the characteristic equation. (10%)

2. (15%) Supposed that the overall transfer function of a system is



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

Find the impulse response of this system.

3. (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%)

4. (20%) For a unity feedback system with controller $C(s)=K$ and

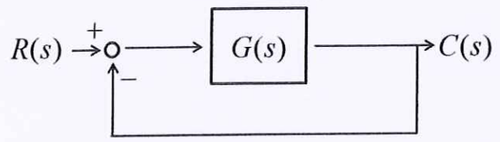
$$G(s)=\frac{2}{s(s+1)(s+10)}$$

(a) Determine $\angle G(jw)$ at $w=0^+$. (10%)

(b) Determine $\angle G(jw)$ at $w\to\infty$. (10%)

5. (30%) Consider the following system with unity feedback, where

$$G(s)=\frac{s+3}{(s+1)(s^2+4s+7)}$$



Is this system stable? If yes (i.e. stable), calculate the <u>steady state error for a step input</u> and the <u>steady state error for a ramp input</u>; otherwise (i.e. unstable), <u>prove that it is unstable by the Routh's Criterion</u>.