

國立中正大學

113 學年度碩士班招生考試

試題

[第 1 節]

科目名稱	控制系統
系所組別	電機工程學系-電力與電能處理甲組

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

國立中正大學 113 學年度碩士班招生考試試題

科目名稱：控制系統

本科目共 1 頁 第 1 頁

系所組別：電機工程學系-電力與電能處理甲組

1. (20 %) Consider the SFG shown in Fig. 1.

- (a) Find the gain between y_1 and y_2 using the gain formula.
 (b) Find the gain between y_2 and y_6 using the gain formula.

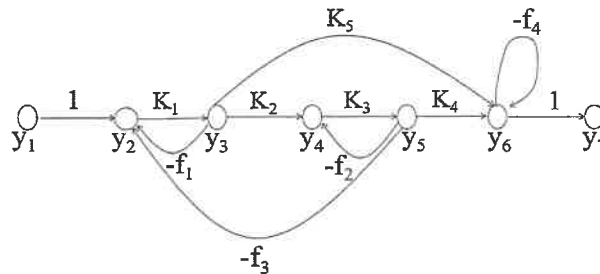


Fig. 1

2. (20%) Fig. 2 shows a PI control system with $F(s) = F_1 + \frac{F_2}{s}$ and $G(s) = \frac{100}{s^2 + 10s + 100}$.

- (a) Find the value of F_2 so that the steady state error to unit ramp input is 10%.
 (b) Construct the root loci for $F_1 \geq 0$ with the value of F_2 determined in part (a).

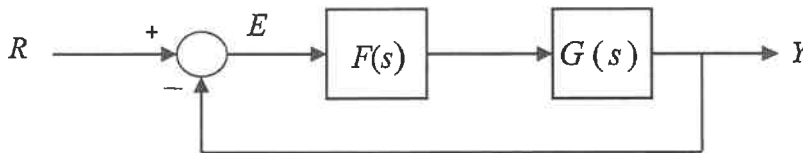


Fig. 2

3. (40%) The transfer function of a unity-feedback control system with positive gain F is

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

- (a) Apply the Nyquist criterion to determine the range of F for stability.
 (b) Check the answer in part (a) with the Routh-Hurwitz criterion.
 (c) Find the value of F so that the gain margin of the system is 10 dB.
 (d) If $F=1$, find the phase margin of the system.

4. (20%) Fig. 3 shows a circuit where the $u(t)$ is an input and the voltage of the R_y is output.

- (a) Find the state equations when the inductor current and the capacitor voltage are the state variables.
 (b) Determine the conditions that the system is stable and controllable.

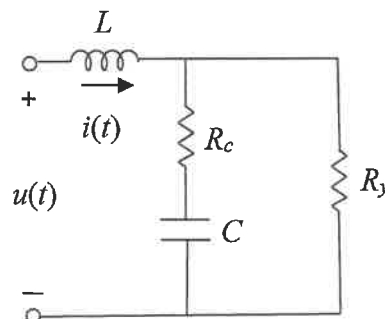


Fig. 3