

國立臺北科技大學九十九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

第二節 自動控制 試題 (選考)

第一頁 共一頁

注意事項：

1. 本試題共 4 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. The accelerometer in Fig. 1 is mounted on the machine of which the acceleration is to be measured. Under certain conditions, the displacement $(x-y)$ of m relative to the housing is a measure of acceleration.

(1) Write the differential equation of this system for the input x and the output y (10%)

(2) Derive the transfer function $G(s) = \frac{X-Y}{X}$ (10%)

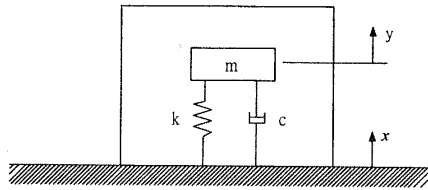


Fig. 1

2. For the system in Fig. 2 with $G(s) = \frac{1}{s(s+1)}$

(1) $G_c(s) = K$, find the value of K so that the closed-loop system has damping ratio of 0.707. (10%)

(2) $G_c(s) = K$, determine the range of K for stable closed-loop system. (10%)

(3) $G_c(s) = K \left(1 + \frac{K_I}{s} \right)$, explain the effects when $\frac{K_I}{s}$ is added to the controller. (10%)

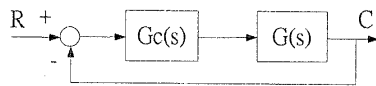


Fig. 2

3. For a system in Fig. 3 with plant transfer function $G(s) = \frac{1}{s(s+1)(s+5)}$

(1) With P control $G_c = K$, what is the system type number? (5%)

(2) Sketch the root-locus of the system with respect to K and obtain the asymptotes (15%)

(3) Obtain the breakaway point of the root-locus. (10%)

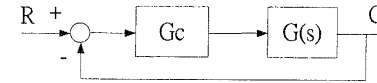


Fig. 3

4. Derive a state model representation, with displacement y of mass m_3 as output, for the mechanical system in Fig. 4.

(1) Write the differential equations of this system. (10%)

(2) Write the state-space equation of this system. (10%)

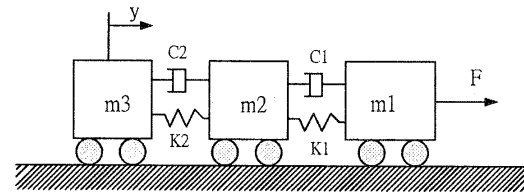


Fig. 4