逢甲大學101學年度碩士班招生考試試題 編號：007 科目代碼：

科目	控制系統	適用系所	機械與電腦輔助工程學系機械工程碩士班控制組	時間	120 分鐘

※請務必在答案卷作答區內作答。 共 2 頁第 1 頁

Problem 1 (50%)

For the circuit as shown in Figure P1, $e_i(t)$ is input voltage and $e_o(t)$ is output voltage. (a) Obtain the transfer function($G(s)=E_o(s)/E_i(s)$) of this system. (b) Obtain the output $e_o(t)$ if $e_i(t)$ is a unit step function. (c) Obtain the output $e_o(t)$ for $e_i(t)=10\sin(\omega t)$ and $t>0$.

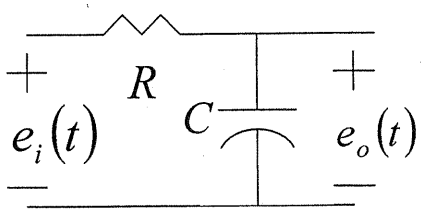


Figure P1

Problem 2 (50%)

For the system as shown in Figure P2, (1) draw the root locus as K varies from 0 to infinity, and (2) determine the range of K so that the system is stable.

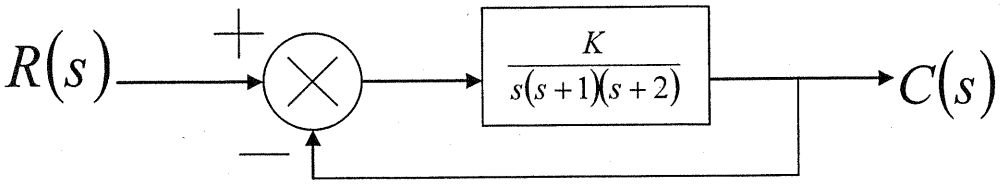


Figure P2

Problem 3 (50%)

Consider the open loop system with the transfer function

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

And the input $x(t)=\sin t+\mathbf{0.1}\sin \mathbf{1000}t$

Obtain the sterdy state output $y_{ss}(t)$

Problem 4 (50%)

Consider the unity-feedback system with the closed loop transfer function

$$\frac{C(s)}{R(s)} = \frac{k}{s(s^2+s+1)(s+2)+k}$$

Determine the stability of the system by the Nyquist stability method

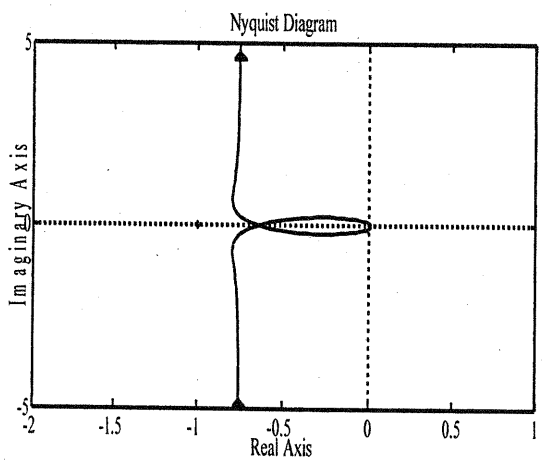
The Nyquist diagrams of

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

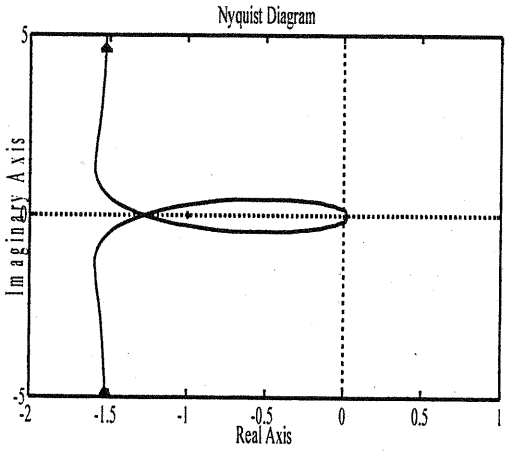
for $k=1$ and $k=2$ are shown in Figure P4 (a) and (b) respectively.

(i) When $k=1$ is the system stable, why?

(ii) When $k=2$ is the system stable, why?



(a) K=1



(b) k=2

Figure P4