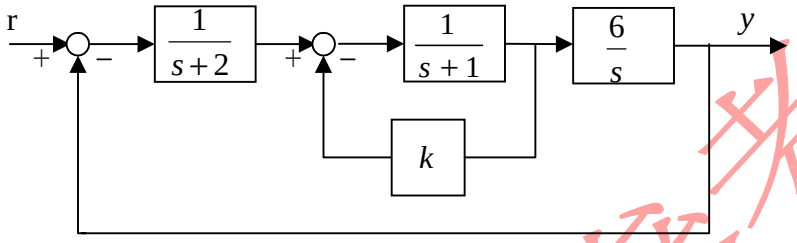
大葉大學九十學年度研究所碩士班招生考試試題紙			
系 所 組 別	考 試 科 目 （中 文 名 稱）	考 試 日 期	備 註
自動化工程學系甲組	控制工程	4 月 22 日 第 2 節	可攜帶計算機 P2-1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1. Consider the feedback control system as shown bellow. (20%)



(a) Find the transfer function $\frac{Y(s)}{R(s)}$. (5%)

(b) Sketch the root-loci of the system for $k \geq 0$, including the breakaway points. (15%)

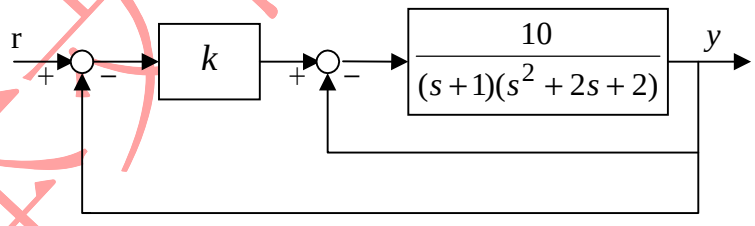
2. For a unity feedback control system with the plant (20%)

$$G(s) = \frac{10(s+0.1)}{s(s+1)(s^2+2s+100)}.$$

(a) Sketch a Bode plot (magnitude and phase plots). (10%)

(b) Would the system be stable? (10%)

3. Consider the feedback control system shown bellow. (20%)



(a) If $r(t)$ is unit step input, determine k so that the steady state error is 0.1. (10%)

(b) Use the Routh-Hurwitz stability criterion to determine the range of k so that the feedback system is stable. (10%)

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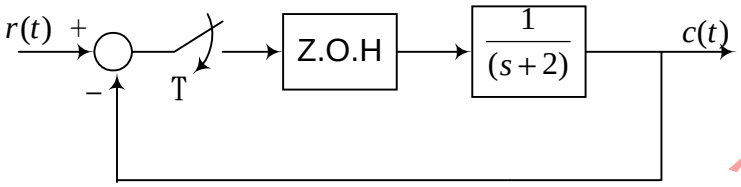
自動化工程學系甲組	控制工程	4 月 22 日 第 2 節	可攜帶計算機 P2-2

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

4. Consider the following digital control system. (20%)



(a) Compute the transfer function $\frac{C(z)}{R(z)}$. (10%)

(b) If T=0.1 sec and $r(t)$ is a unit step input, find the steady state value, $c(\infty)$. (10%)

5. Given a transfer function (20%)

$$G(s)=\frac{Y(s)}{U(s)}=\frac{s+1}{s^2+2s+2}.$$

(a) Determine its state variable description

$$\dot{\mathbf{x}}(t)=\mathbf{A}\mathbf{x}(t)+\mathbf{B}u(t)$$
$$y(t)=\mathbf{C}\mathbf{x}(t)$$

in control canonical form. (10%)

(b) Let $u(t)=[k_1,k_2]\begin{bmatrix}x_1(t)\\x_2(t)\end{bmatrix}$, find the values of k_1 and k_2 so that the closed loop system has damping rate $\xi=0.5$ and nature frequency $\omega_n=4$ rad/sec. (10%)