中原大學 100 學年度 碩士班 入學考試

3 月 19 日 13:30~15:00　　電機工程學系智慧控制組　　誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：控制工程　　（共 2 頁第 1 頁）

□可使用計算機，惟僅限不具可程式及多重記憶者　　□不可使用計算機

1. In Fig. 1, input= $h(t)=\delta(t)$, the transfer function $G(s)=\frac{-6}{s+3}+\frac{7}{s+2}-\frac{1}{s+1}$, suppose that $G(s)$ is the Laplase transform of $g(t)$, output= $r(t)$, (a) transfer function zeros are ? (5%) (b) transfer function poles are ? (5%) (c) $g(t)$ is ? (5%) (d) the output $r(t)$=? (5%)

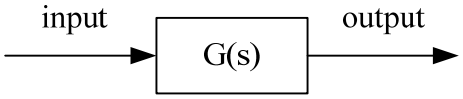

Fig. 1

2. In Fig. 2, (a) plot the state diagram (10%) (b) $\frac{I(s)}{E(s)}$? (5%) (c) $\frac{E_c(s)}{E(s)}$?(5%)

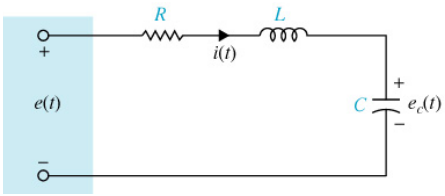

Fig. 2

3. Consider the state equation $\begin{bmatrix}\frac{dx_1(t)}{dt}\\ \frac{dx_2(t)}{dt}\end{bmatrix}=\begin{bmatrix}0 & 1\\ -2 & -3\end{bmatrix}\begin{bmatrix}x_1(t)\\ x_2(t)\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}u(t)$, with the input is $u(t)=1$ for $t\geq 0$ and $x_1(0)=x_2(0)=0$. Please determine (a) the state-transition matrix $\phi(t)$ (10%) and (b) the state vector $x(t)=\begin{bmatrix}x_1(t)\\ x_2(t)\end{bmatrix}$ for $t\geq 0$ (10%).

4. The characteristic equation of a closed-loop system is $s^3+3Ks^2+(K+2)s+4=0$. Find the range of K so that the system is stable. (10%)

5.The forward-path and closed-loop transfer functions of the system are shown in Fig. 3 with $H(s)=\frac{5(s+1)}{s+5}$ and $G(s)=\frac{1}{s^2(s+12)}$. Derive the steady state errors of (a) unit-step input (5%) (b) unit-ramp input (5%) (c) unit-parabolic input (5%).

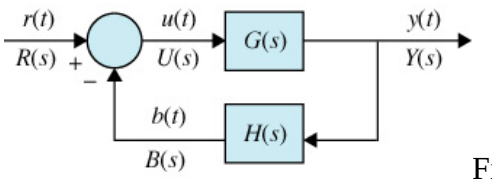

Fig. 3

6.Consider the equation $s^3+K_1s+K_1=0$, where K_1 is a variable parameter, which varies from 0 to ∞. Sketch the root locus. (15%)

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