

國立成功大學

112學年度碩士班招生考試試題

編 號：170

系 所：電機工程學系

科 目：控制系統

日 期：0206

節 次：第 2 節

備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. For the system shown in Fig. 1, find the sensitivity of the steady-state error for changes in K_1 and in K_2 , when $K_1 = 200$ and $K_2 = 0.2$. Assume step inputs for both the input and the disturbance. (25%)

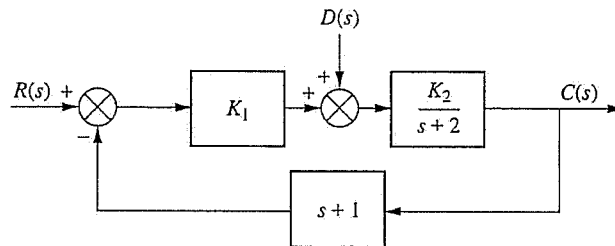


Fig. 1

2. The system shown in Fig. 2 has $G_1(s) = \frac{1}{s(s+2)(s+4)}$. Use the Routh-Hurwitz criterion to find the values of K_1 and K_2 for which the system oscillates at a frequency of 5 rad/sec. (25%)

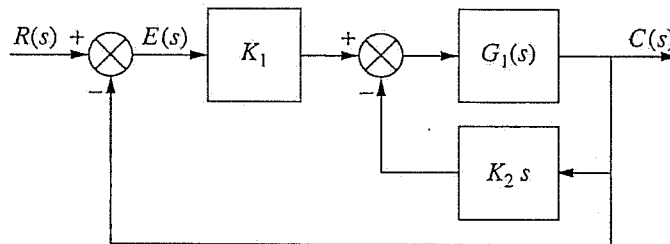


Fig. 2

3. A system transfer function is given by $\frac{y(s)}{r(s)} = \frac{4}{s^3 + 3s^2 + 6s + 4}$ and the unit-step response is described by

$y(t) = 1 + Ae^{-pt} + Be^{-\sigma t} \sin(\omega t - \theta)$. Please derive and determine A, p, B, σ, ω , and θ . (25%)

4. A system transfer function is given by $\frac{y(s)}{u(s)} = \frac{s}{s^2 + 7}$.

(a) Please derive **A**, **B**, and **C** and write a set of equations that describe this system in the control canonical form as $\dot{\mathbf{x}} = \mathbf{Ax} + \mathbf{Bu}$ and $y = \mathbf{Cx}$. (15%)

(b) Design a control law of the form, $u = -[k_1 \quad k_2]\mathbf{x}$, which will place the closed-loop poles at $s = -4 \pm j5$. (10%)