國立成功大學
111學年度碩士班招生考試試題

編　號：169

系　所：電機工程學系

科　目：控制系統

日　期：0219

節　次：第 2 節

備　註：不可使用計算機

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※ 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. Let $KG(s)=\dfrac{K(s+1)}{(s+25)(s-2)^2}$. Sketch the root locus for $1+KG(s)=0$, $K\geq 0$. Be sure to calculate the asymptotes and their intersection, give the arrival and departure angles of multiple roots, and find imaginary-axis crossings and the corresponding value of K, and determine the range of K for stable closed-loop system. Also, figure out values of K at multiple roots. (25%)

2. A unity feedback control system has the open-loop transfer function $KG(s)=\dfrac{K(s+8)^2}{s^3}$. Apply Nyquist plot design method to find the range of K such that the closed-loop system is stable, where the Nyquist path is chosen as in *Fig* 1. (25%)

3. For the circuit shown in *Fig*. 2, find the transfer function $G(s)=V_o(s)/V_i(s)$ using nodal analysis. (25%)

4. Convert the block diagram of *Fig*. 3 to a signal-flow graph. Use Mason's rule to find the transfer functions $C(s)/R(s)$ for the resulting signal-flow graph. (25%)

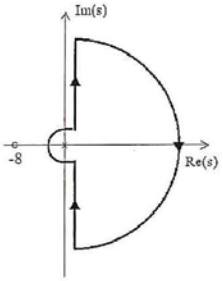

Fig. 1. Nyquist path for Problem 2.

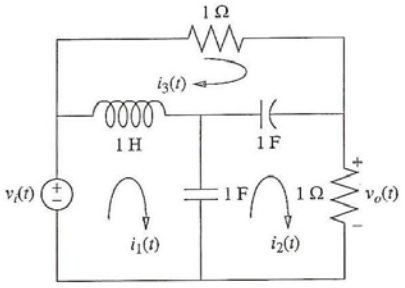

Fig. 2

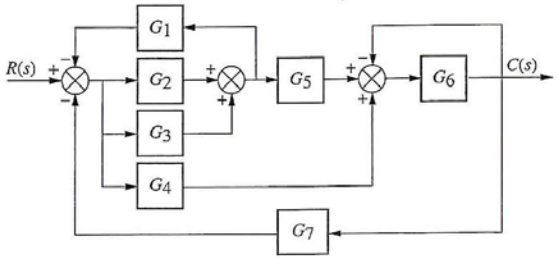

Fig. 3