

國立宜蘭大學

105 學年度研究所碩士班考試入學

自動控制試題

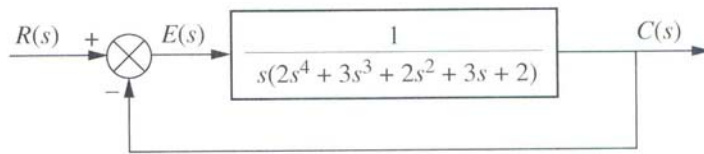
(電機工程學系碩士班)

准考證號碼：

《作答注意事項》

- 1.請先檢查准考證號碼、座位號碼及答案卷號碼是否相符。
- 2.考試時間：100 分鐘。
- 3.本試卷共有問答題 5 題，一題 20 分，共計 100 分。
- 4.請將答案寫在答案卷上。
- 5.考試中禁止使用大哥大或其他通信設備。
- 6.考試後，請將試題卷及答案卷一併繳交。
- 7.本考科可使用非程式型（不具備儲存程式功能）之電子計算機。

1. (20%) Find the number of poles in the left half-plane, in the right half-plane, and on the $j\omega$ -axis for the system shown below.



2. (20%) Give the system $\dot{x} = \begin{bmatrix} 0 & 3 & 1 \\ 2 & 8 & 1 \\ -10 & -5 & -2 \end{bmatrix} x + \begin{bmatrix} 10 \\ 0 \\ 0 \end{bmatrix} u$, $y = [1 \ 0 \ 0]$, find out how many

poles are in the left half-plane, in the right half-plane, and on the $j\omega$ -axis.

3. (20%) A second order system with two poles $-3 + j7$ and $-3 - j7$, find *damping ration* (ξ), *natural frequency* (ω_n), *peak time* (T_p), *maximal overshoot* (%OS) and *setting time* (T_s).

4. (20%) Give a unity feedback system that has the forward transfer function

$$G(s) = \frac{K(s+2)}{(s^2 - 4s + 13)}$$

do the following:

- Sketch the root locus.
 - Find the imaginary-axis crossing.
 - Find the gain, K , at the $j\omega$ -axis crossing.
 - Find the break-in point.
 - Find the angle of departure from the complex poles.
5. (20%) Please explain how a second order system response will be changed in *maximal overshoot*, *settling time* and *peak time* (a) with an additional pole; (b) with an additional zero.