

國立宜蘭大學

104 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 5 題問答題，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%) Give the transfer function $G(s) = \frac{36}{s^2 + 4.2s + 36}$, find ξ and ω_n .
2. (20%) Let us add a **pole** and a **zero** to a second-order system ($0 < \xi < 1$), please describe how the *maximal overshoot*, the *rise time* and the *settling time* of the system response will be changed.

3. (20%) Given a unity feedback system that has the forward transfer function

$$G(s) = \frac{k(s-2)(s-4)}{s^2 + 6s + 25}$$

- Sketch the root locus.
 - Find the gain, K , at the $j\omega$ -axis crossing.
 - Find the break point.
 - Find the range of gain, K , for which the system is stable.
4. (20%) Find the gain and phase margin for an unity feedback control system, where

$$G(s)H(s) = \frac{6}{(s^2 + 2s + 2)(s + 2)}$$

5. (20%) Give the system

$$\dot{x} = \begin{bmatrix} 0 & 3 & 1 \\ 2 & 8 & 1 \\ -10 & -5 & -2 \end{bmatrix} x + \begin{bmatrix} 10 \\ 0 \\ 0 \end{bmatrix} u$$

$$y = [1 \ 0 \ 0]x$$

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