

國立臺北科技大學

九十三學年度電機工程系博士班入學考試

控制系統試題

填准考證號碼

第一頁 共一頁

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注意事項：

1. 本試題共五題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Given 4 vectors $e_1 = [1 \ 6]^T$, $e_2 = [3 \ 18]^T$, $e_3 = [2 \ 5]^T$, and $e_4 = [3 \ 1]^T$, if $x = 2e_1 + 3e_2 - e_3 + 4e_4$, find the representation of x with respect to the set of vectors obtained by Schmidt Ortho-normalization process based on e_1, e_2, e_3 and e_4 . (20%)
2. Find the bases of range space and null space of the following matrix: (20%)

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 0 & -1 & -2 & 2 \\ 4 & 0 & 1 & 5 \end{bmatrix}.$$

3. Given a matrix A as following, find the modal matrix P and the Jordan Blocks of A . (20%)

$$A = \begin{bmatrix} 2 & 0 & -1 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & -1 & 0 & 3 \end{bmatrix}$$

4. If $G(s) = \begin{bmatrix} \frac{3}{s+5} & \frac{4s+2}{(s+5)(s-3)} \\ \frac{4s-2}{s-3} & \frac{-5s+1}{s+5} \end{bmatrix}$, find the realization of $G(s)$ by rows and columns, respectively. (20%)

5. If $H(s) = \begin{bmatrix} \frac{3s-7}{4s+5} & \frac{6s+5}{s+3} \\ \frac{7s-8}{(4s+5)(s+3)} & \frac{4s-7}{(s+3)^2} \end{bmatrix}$, find the controller and observer canonical form,

respectively, of H(s). (20%)