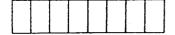
國立臺北科技大學

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



- 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 $e_1 = \begin{bmatrix} 1 & 6 \end{bmatrix}^T$, $e_2 = \begin{bmatrix} 3 & 18 \end{bmatrix}^T$, $e_3 = \begin{bmatrix} 2 & 5 \end{bmatrix}^T$, and $e_4 = \begin{bmatrix} 3 & 1 \end{bmatrix}^T$, if $x = \begin{bmatrix} 1 & 1 \end{bmatrix}^T$ 2e₁+3e₂-e₃+4e₄, 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:

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

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 $G(s) = \begin{bmatrix} \frac{3}{s+5} & \frac{4s+2}{(s+5)(s-3)} \\ \frac{4s-2}{s-3} & \frac{-5s+1}{s-3} \end{bmatrix}$, 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%)