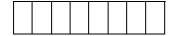
國立臺北科技大學

九十六學年第一學期電機系博士班資格考試

現代控制理論試題(公告用)

填學生證號碼

第一頁 共一頁



- 1. 本試題共【6】題,配分共 120 分,70 分及格。
 2. 請按順序標明題號作答,不必抄題。
 3. 全部答案均須答在試卷答案欄內,否則不予計分。
 4. 考試時間:二小時。

 1. Given a matrix $\mathbf{A} = \begin{bmatrix} 0 & 1 \\ -9 & -6 \end{bmatrix}$, find $\cos(\mathbf{A}t)$. (20%)
- 2. Given a matrix $\mathbf{A} = \begin{bmatrix} 1 & 3 & -4 & 0 & 1 & -2 \\ 2 & 4 & 0 & -3 & 0 & -3 \\ 0 & 1 & 0 & 2 & 2 & 3 \end{bmatrix}$, (a) find the orthonormal bases of the range space

of A; (b) find the orthonormal bases of the null space of A. (20%)

- 3. Given that two matrices **A** and **B** are similar, show that **A** and **B** have the same eigenvalues. (20%)
- 4. Show that the controllability of a system (A,B,C,D) is invariant under any equivalence transformation. (20%)
- 5. Given a transfer function $M(s) = \frac{s+2}{(s+1)(s+3)(s+2)}$, please transform the M(s) into a dynamic equation which is (a) a controllable canonical form (b) a observer canonical form. Please verify your controller canonical form in (a) and observer canonical form in (b) is controllable or observable, respectively. (20%)
- 6. Find a state feedback gain for the system (A, B, C) where (20%)

$$A = \begin{bmatrix} 1 & 1 & -2 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}, C=[1\ 2\ 3].$$
 so that the resulting system has eigenvalues -3, -2 ± j1.