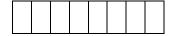
國立臺北科技大學

九十八學年第一學期電機系博士班資格考試

最佳控制試題

第一頁 共一頁



- 注思于六

 1. 本試題共【4】題,配分共100分。

 2. 請按順序標明題號作答,不必抄題。

 3. 全部答案均須答在試卷答案欄內,否則不予計分。
- 1. Consider the system Ax = b which has many solutions, where $A \in \mathbb{R}^{n \times m}$, n < m, and AA^T is nonsingular. Find the minimum norm solution \tilde{x} .
- 2. Given the ARE

$$PA + A^T P + C^T C - PBR^{-1}B^T P = 0.$$

The associated Hamiltonian matrix is $M = \begin{bmatrix} A & -BR^{-1}B^T \\ -C^TC & -A^T \end{bmatrix}$. Show that M has no pure

imaginary eigenvalues under the controllability of (A, B) and observability of (C, A).

- 3. Let $\dot{x}_1 = x_2$, $\dot{x}_2 = u$, $J = \frac{1}{2} \int_0^\infty \left(x_1^2 + x_2^2 + u^2 + 2x_1 u \right) dt$. Find the optimal control law u^* .
- 4. Consider the first-order plant $\dot{x} = x + u$, y = x. The control law u = -5x is an optimal law for this plant.
 - Calculate the observer gain adopted as the steady-state Kalman filter gain with the weighting matrices Q = 1 and R = 1.
 - Find the transfer function of the observer-based controller (from y to u).