

國立臺灣科技大學

九十二學年度博士班招生考試試題

系所組別：工程技術研究所自動化及控制學程博士班

科目：自動化及控制系統

總分 100 分，請依序作答。



1. Explain the following term (30%)

- (a) MIS (5%)
- (b) TPM (5%)
- (c) CIM (5%)
- (d) SCADA (5%)
- (e) CALS (5%)
- (f) ERP (5%)

2. Consider the system defined by $\dot{\mathbf{x}} = \mathbf{A}\mathbf{x} + \mathbf{B}u$, where $\mathbf{A} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix}$, $\mathbf{B} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$.

By using the state feedback control $u = -\mathbf{K}\mathbf{x}$, it is desired to have the closed-loop poles at $s = -2 \pm j4$ and $s = -10$. Determine the state feedback gain matrix \mathbf{K} . (20%)

3. (25%)

A position control system is shown in Fig. 1(A), which control parameter K_V can be designed to satisfy the required control performance. If the control performance in such a system still cannot satisfy the requirement, an inner loop velocity feedback can be used as shown in Fig. 2(B).

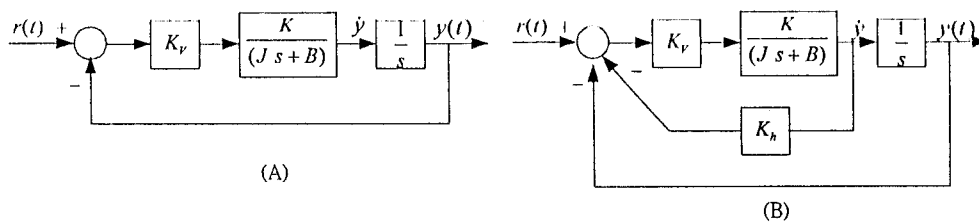


Fig. 1

- (a) Derive the closed-loop transfer functions for the above two control systems (10%)
- (b) Discuss the influence of the additional velocity feedback in the position control system (8%)
- (c) If a differentiator is used for the feedback of velocity signals, please explain what problem will appear, and how to improve it? (7%)

4. Please compare Laplace Transform and Fourier Transform: (25%)

- (a) Describe the definition of Laplace Transform and Fourier Transform; explain the existence conditions for Laplace Transform and Fourier Transform. (7%)
- (b) Discuss the transformation relations between Laplace Transform and Fourier Transform? (8%)
- (c) Given $f(t) = 1 - e^{-10t}u(t)$, determine the Laplace Transform and the Fourier Transform?

Discuss the results according to (b) (10%)