

國立臺灣科技大學  
九十三學年度博士班考試試題

系所組別：工程技術研究所自動化及控制學程  
科目：自動化及控制系統

總分爲 100 分

1. Explain the following problem: (25%)

- (1) Sampling theorem
- (2) Controllability
- (3) FMS
- (4) CALS
- (5) AGV

2. Please explain the five fundamental systems and their functions in the flexible manufacturing system (FMS). (25%)

3. Consider the system defined by  $\dot{\mathbf{x}} = \mathbf{Ax} + \mathbf{Bu}$

$$\text{where } \mathbf{A} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -1 & -5 & -6 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

By using the state feedback control  $u = -\mathbf{Kx}$ , it is desired to have the closed-loop poles at  $s = -2 \pm j4$  and  $s = -10$ . Determine the state feedback gain matrix  $\mathbf{K}$ . (25%)

4. Please derive the mathematical model of the inverse pendulum system, where the inverse pendulum is mounted on a motor-driven cart. Consider only the two dimensional problem where the pendulum moves only in the plane. (25%)

