

國立台灣科技大學九十六學年度碩博士在職專班招生試題

系所組別： 自動化及控制研究所博士在職專班

科 目： 自動控制系統

總分為 100分

1. Explanation(automation fields): (20%)

(1) SCADA (2) AOI (3) SECS I/II (4) HMI

2. State the development roadmap and the future trend of automation technologies for manufacturing systems. (15%)

3. Find the fundamental matrix and the unique solution for the following system : (15%)

$$\begin{aligned} 8x_1 - x_2 - x_3 &= 4 \\ x_1 + 2x_2 - 3x_3 &= 0 \\ 2x_1 - x_2 + 4x_3 &= 5 \end{aligned}$$

4. In designing control systems, the following aspects must be taken into account. (15%)

- (a) Stability
- (b) Input amplitude constraints
- (c) Disturbance rejection
- (d) Noise filtering
- (e) Sensitivity and robustness

Explain the significance of each.

5. Construct the root locus for $K > 0$, for the open-loop transfer function (10%)

$$GH = \frac{K}{s(s+1)(s+3)(s+4)}$$

6. Solve the following differential equation with the given initial conditions.

$$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 2x = \sin 2t$$

$$x(0)=1; \quad \frac{dx(0)}{dt} = -1. \quad (10\%)$$

7. Physically, what happens to a system that is unstable? (5%)

8. A system is described by the following differential equation:

$$\frac{d^3y}{dt^3} + 5\frac{d^2y}{dt^2} + 7\frac{dy}{dt} + y = \frac{d^3x}{dt^3} + 2\frac{d^2x}{dt^2} + 3\frac{dx}{dt} + 7x$$

Find the expression for the transfer function of the system, $\frac{Y(s)}{X(s)}$. (10%)