

國立臺灣科技大學

九十四學年度碩士在職專班招生考試試題

系所組別：電機工程系碩士在職專班乙組

科 目：控制工程

總分 100 分

1. Determine the controllability and observability of the following systems. In each system, x , y and u represent the state, output and input, respectively.

$$(a) \dot{x} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u, \quad y = [1 \ 2 \ 3]x \quad (15\%)$$

$$(b) \dot{x} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} u, \quad y = [1 \ 1 \ 1]x \quad (15\%)$$

2. Using the Routh-Hurwitz criterion, determine the stability of the closed-loop system that has the following characteristic equations.

$$(a) s^3 + 25s^2 + 250s + 10 = 0 \quad (10\%)$$

$$(b) s^4 + 2s^3 + 10s^2 + 20s + 5 = 0 \quad (10\%)$$

3. Briefly describe

- phase-lag controller (5%)
- tachometer (5%)
- root locus technique (5%)
- gain margin (5%)

4. The block diagram of a feedback control system is shown in Fig. P. 4.

- Find the open-loop transfer function $C(s)/E(s)$ (5%).
- Find the closed-loop transfer function $C(s)/R(s)$ (5%).

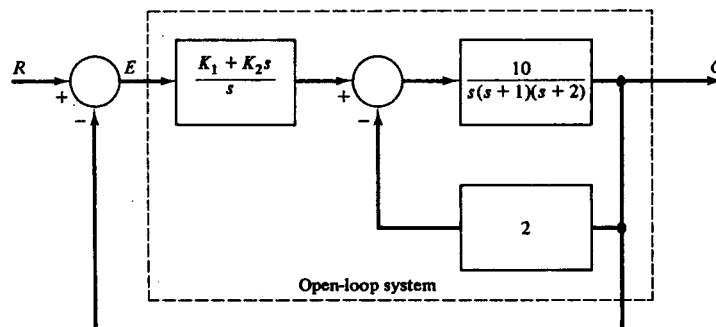


Fig. P. 4.

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5. Fig. P. 5. is a typical unit step response of a control system. Please draw the figure on your answering paper to indicate and explain

- (a) rise time (5%)
- (b) maximum overshoot (5%)
- (c) delay time (5%)
- (d) settling time (5%)

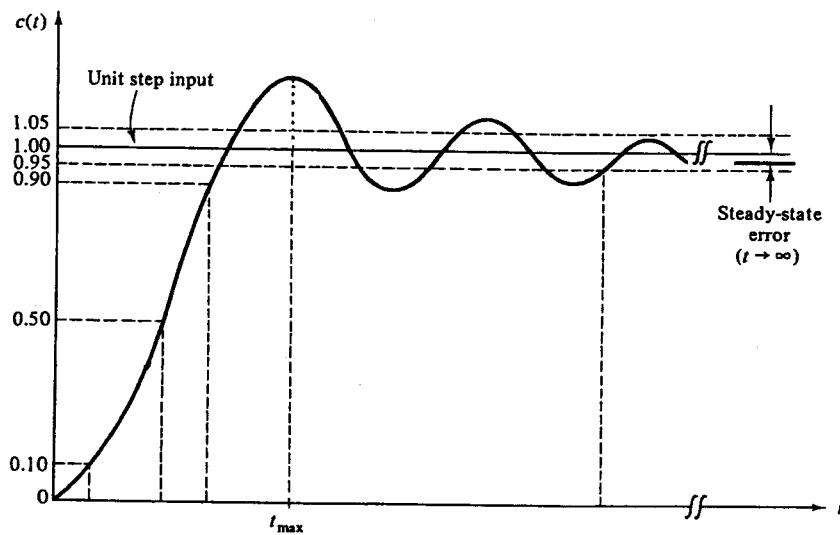


Fig. P. 5

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