臺灣綜合大學系統109學年度學士班轉學生聯合招生考試試題

科目名稱	自動控制	類組代碼	D39
		科目碼	D3992

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 3 頁

單選題(每題 7 分)

1. Which second order system has the minimal percentage overshoot when a step input is applied?

(A) $\frac{1}{s^2+s+3}$ (B) $\frac{1}{s^2+3s+6}$ (C) $\frac{1}{2s^2+5s+2}$ (D) $\frac{1}{4s^2+5s+20}$

2. Which system has the smallest d.c. gain when a step input is applied?

(A) $\frac{1}{s^2+s+3}$ (B) $\frac{1}{s^2+3s+6}$ (C) $\frac{1}{2s^2+5s+2}$ (D) $\frac{1}{4s^2+5s+20}$

3. Which system has the shortest ±5% settling time when a step input is applied?

(A) $\frac{1}{s^2+s+3}$ (B) $\frac{1}{s^2+3s+6}$ (C) $\frac{1}{2s^2+5s+2}$ (D) $\frac{1}{4s^2+5s+20}$

4. What kind of feedback controllers can be used to eliminate steady-state errors with respect of step input when the plant is type 0?

(A) Proportional controller (B) Derivative controller (C) Integral controller (D) Proportional-Derivative controller

5. Given a unity positive feedback system with an open-loop transfer function as $\frac{10s+32}{s^4+8s^3+15s^2+2s+16}$, and verify that how many poles are located in the left hand S-plane?

(A) 1 (B) 2 (C) 3 (D) 4

6. Find the gain margin and phase margin of the system whose open loop transfer function is formed as follows:

$$G(s)=\frac{6}{(s^2+2s+2)(s+2)}$$

(A) $10.45dB, 67.7^\circ$ (B) $1.45dB, 6.7^\circ$ (C) $10.45dB, 6.7^\circ$ (D) $1.45dB, 67.7^\circ$

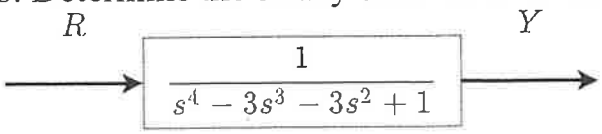
7. Consider the system whose open-loop is formed as follows with the negative unity feedback:

$$G(s)=\frac{K}{(s+2)(s+4)(s+5)}$$

Please determine the maximum value of K which let the system be stable.

(A) 0.4 (B) 4000 (C) 4 (D) 400

8. Determine the steady state error of the following system.



(A) No steady state error (B) 0 (C) 1 (D) 10

9. The steady state error of a negative feedback closed-loop system with a forward path $G(s)=\frac{1}{s(s+5)}$ with respect to a ramp input is $e_{ss}=25$. Find the slope of the ramp input.

(A) 3 (B) 4 (C) 5 (D) 6

10. Determine the steady state error:

$$\dot{x}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -1 & -3 & -3\end{bmatrix}x+\begin{bmatrix}0\\ 0\\ 1\end{bmatrix}u$$, where u is unit step input.

$$y=\begin{bmatrix}1 & 0 & 0\end{bmatrix}x$$

(A)-2/3 (B) -1/3 (C) 0 (D) 1/3 (E) 2/3

複選題(每題 10 分)

11. Which of the descriptions for the PD controller are true?

(A) The stability boundary will be increased.

(B) It's suitable for restraining the high frequency noise.

(C) It's usually decreasing the rising time of the step response.

(D) It can increase the damping ratio of the second order underdamped systems.

(E) It's a kind of phase-lead compensator.

12. Which of the following descriptions for the PI controller are true?

(A) The stability boundary will be increased.

(B) It can't eliminate the steady state error of the step response.

(C) It's a kind of phase-lag compensator.

(D) It is not suitable for restraining the low frequency noise.

(E) It can be used to decrease the overshoot of the step response.

13. Consider a linear time-invariant state variable system

($\dot{x}(t)=Ax(t)+Bu(t), y(t)=Cx(t)+Du(t)$), which statements about the system are true?

(A) The transfer function from u to y must be proper.

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(B) If the system is controllable, the order of transfer function from u to y must equal to the number of the state variable.

(C) If the system is observable, the order of transfer function from u to y must not have an unstable zero point.

(D) The controllability of the system can't be changed by the feedback mechanism.

(E) There are no certain relationships between the controllability and the observability of the system.