

八十七學年度 工科系 系(所) _____ 組碩士班研究生入學考試

科目 控制系統 科號 4007 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. Find the time function of $F(s)$

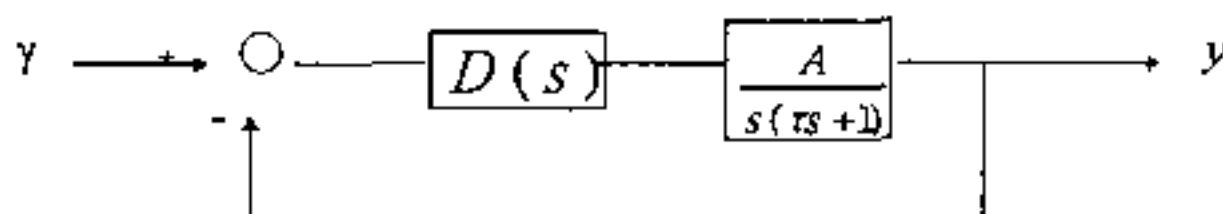
$$F(s) = \frac{s-2}{(s+1)(s+2)^2} \quad (10\%)$$

$$\frac{1}{(s+a)^2} \longleftrightarrow te^{-at}$$

2. Suppose you are to design a unity feedback controller for a second-order plant as shown below. You are to design the controller so that the closed-loop poles are located at $(-3 \pm j2)$.

- What value of ω_n (undamped natural frequency) and ζ (damping ratio) correspond to the closed-loop poles.
- Let $A=1$, $\tau=0.5$, and $D(s)=K(1+T_D S)$. Find values for K and T_D so that the poles of the closed-loop system lie at the desired location.
- If $D(s)=K(1+\frac{1}{T_I S})$, discuss whether the closed-loop poles can be placed anywhere in the complex plane no matter what the value of A and τ .

(20%)

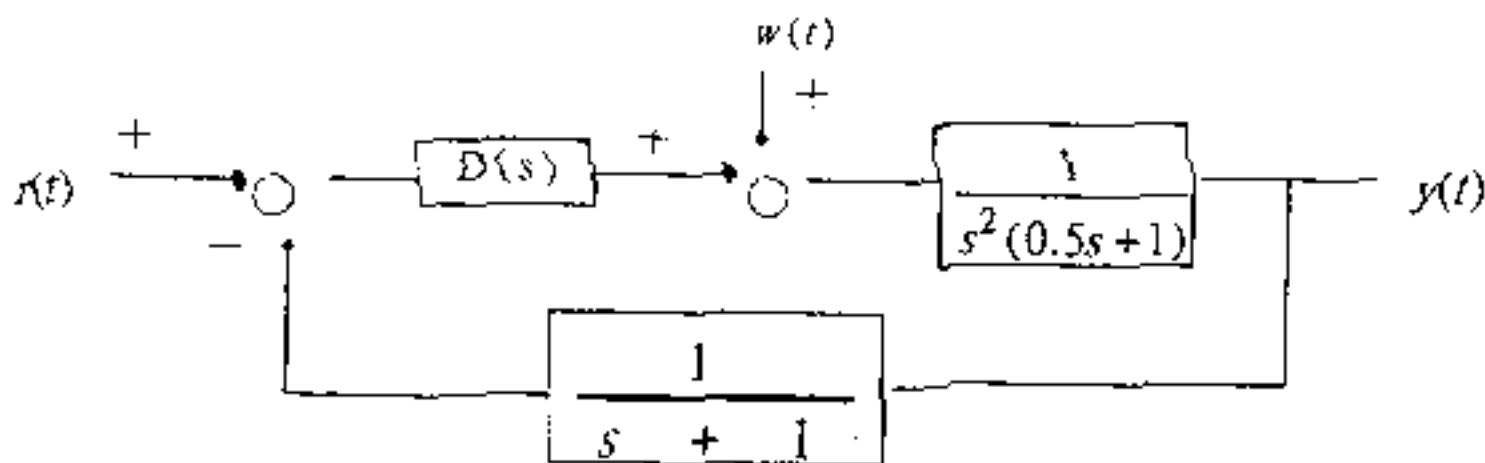


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3. Consider the system show below:

(25%)



- Design a controller as simple as possible such that the system is of type I with respect to reference input.
- What is the system type with respect to disturbance with this design.

4. Plot the root locus approximately for the following transfer function.

(20%)

$$G(s) = \frac{1}{(s+1)(s+5)(s^2+6s+12)}$$

5. Consider the open-loop transfer function.

(25%)

$$\frac{K(10s + 1)}{s(s - 1)}$$

- If $K=1$, plot the Bode plot and Nyquist plot approximately.
- Discuss the stability of unity feedback system with various K .