

國立彰化師範大學 100 學年度碩士班招生考試試題

系所：機電工程學系

組別：甲組

科目：自動控制

☆☆請在答案紙上作答☆☆

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1. A compensated positioning control system is shown in Figure 1.

- (a) Can the system track a step reference input r ? What is the steady-state error? (10%)
 (b) Can the system reject a constant disturbance? What is the steady-state error? (10%)

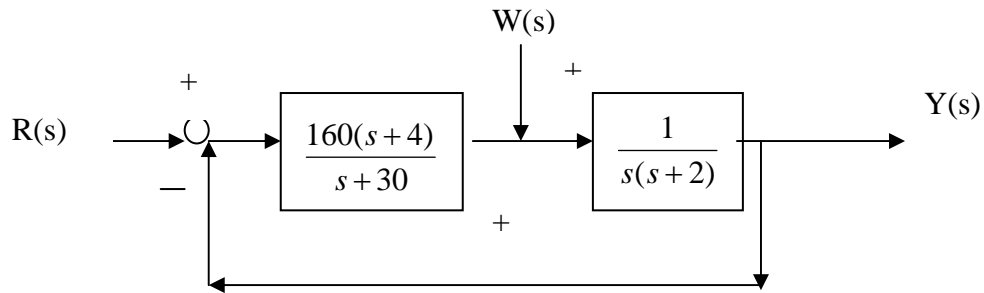


Figure 1

2. (1) Sketch the asymptotes and detailed information of the root locus for the following system in Figure 2. (15%)

- (2) Determine the stability boundary value of the K and roots position for such a closed loop system. (5%)
 (3) Prove your result by Routh-Hurwitz Criterion. (5%)
 (4) Plot the magnitude and phase frequency response (Bode plot) up to 100 (rad/sec). Plot the frequency response based on two different K value. (15%) In your Bode plot, indicated the same value in (2).

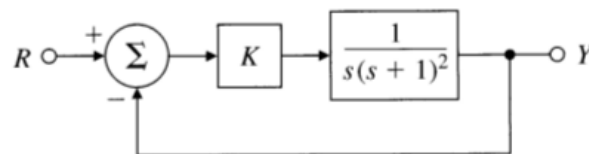


Figure 2

3. Give a third-order linear system with an ordinary differential equation as follows.

$$y^{(3)} + 6y^{(2)} + 11y^{(1)} + 6y = 6u$$

(a) Write it into modern control form.

Define the controllable and observable canonical state space variables and then write it as state space form respectively. (10%)

(b) Solve, plot, and describe the transient response behavior with respect to the time. What is the steady state value if input $u=1$. (10%)

4. (a) What's the definition of a system time constant? (5%)

(b) If you are given an underdamped system step response in time domain, how do you model this system in a second order degree of freedom (D.O.F.) system? (15%)