

淡江大學九十四學年度碩士班招生考試試題 ⁸⁴⁻¹

系別：機械與機電工程學系 科目：自動控制

准帶項目請打「V」	
V	簡單型計算機
本試題共壹頁	

- (20%) For the controlled process shown in Fig. 1, design state and dynamic feedback control so that the state variable x_1 will follow a reference input $w_1 = \text{constant}$ as t approached infinity. The noise signals w_2 and w_3 are unknown constants. The roots of the characteristic equation of the closed-loop system should all be at $s = -3$.

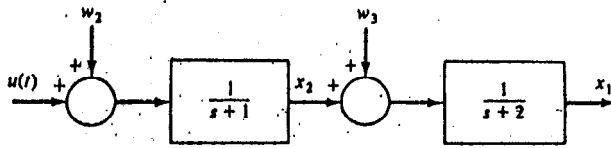


Fig. 1

- (20%) Determine the values of K and k of the closed-loop system shown in Fig. 2 so that the maximum overshoot in unit-step response is 25 % and the peak time is 2 sec. Assume that $J = 1 \text{ kg} - \text{m}^2$.

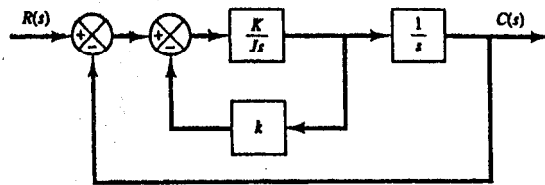


Fig. 2

- (20%) Consider the system shown in Fig. 3. Determine the value of a such that the damping ratio ζ of the dominant closed poles is 0.5.

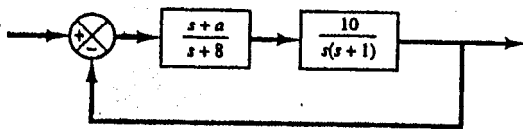


Fig. 3

- (20%) Consider the system shown in Fig. 4. Draw a Bode diagram of the open-loop transfer function $G(s)$. Determine the phase margin and gain margin.

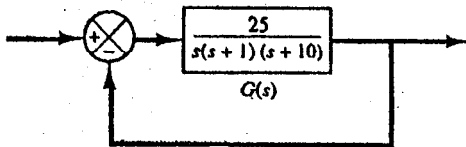


Fig. 4

- (20%) The open-loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{K(s+5)(s+40)}{s^3(s+200)(s+1000)}$$

Discuss the stability of the closed-loop system as a function of K . Determine the values of K that will cause sustained oscillations in the closed-loop system. What are the frequencies of oscillations?