

國立臺灣科技大學  
八十八學年度碩士班招生考試試題

系所別：電子工程系碩士班

組別：乙二組

科目：控制系統

- (1) Please consider the block diagram of a control system shown in Fig. P1. (a) Please determine the closed-loop transfer function of the system. (5%) (b) Suppose the percentage maximum overshoot of the system is 10% and the peak of the step response happens at  $t=0.5$  second. Please calculate the settling time for the step response staying within 2% of its steady-state value (5%) and please find the values of  $K$  and  $M$ . (15%)

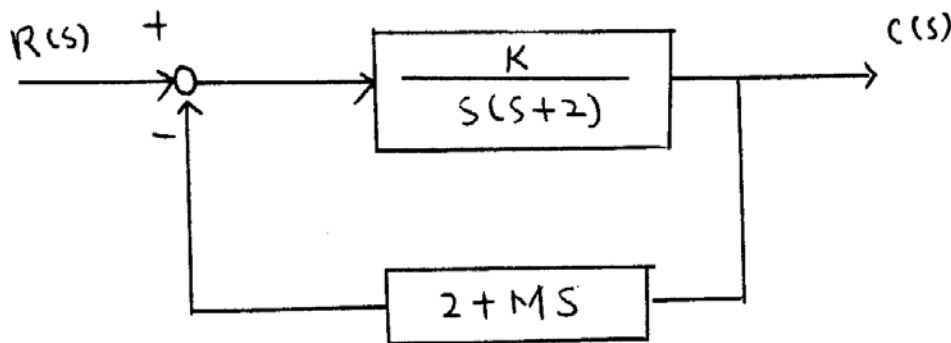


Fig. P1.

- (2) Suppose a dynamic system is governed by the equations

$$y_1(t) = -1.5 y_1(t) + 0.5 y_2(t) + 2r(t)$$

$$y_2(t) = 0.5 y_1(t) - 1.5 y_2(t)$$

If we define a state-space model of this system by choosing  $x_1(t) = 2 y_1(t) + y_2(t)$  and

$x_2(t) = 2 y_1(t) - y_2(t)$  as the states of the system, where the input is  $r(t)$  and output is

$c(t) = y_1(t) + y_2(t)$ . (a) Please determine the equations defining this state-space model. (15%)

(b) Please write down an explicit time-domain equation for the output when the system is driven from a given initial state  $X(t_0)$  at time  $t_0$  by an known input  $r(t)$ . (10%)

- (3) The block diagram of a digital control system is shown in Fig. P3. Please determine range of the gain  $K$  such that the system is stable. (25%)

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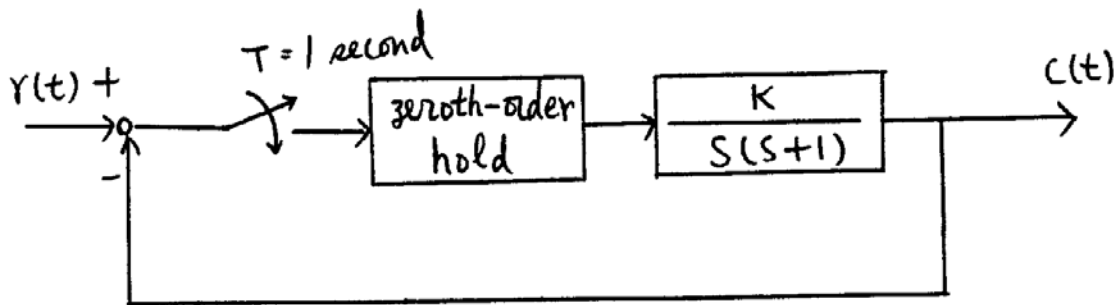


Fig. P3.

- (4) Please plot the complete root locus of the closed-loop control system shown in Fig. P4, and please determine the values of  $K$  such that the system becomes marginally stable. (25%)

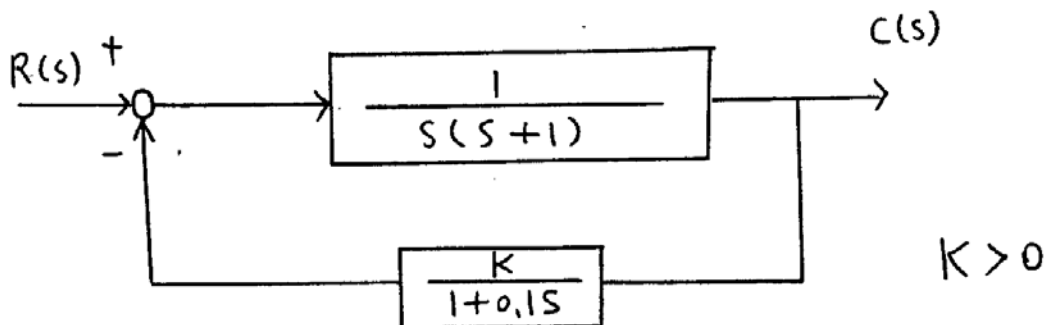


Fig. P4