

國立臺灣科技大學
九十學年度碩士班招生考試試題

系所組別：電子工程系乙二組
科目：線性系統

(總分共100分，作答時請標明題號)

1. (a) Please state the definition for the bounded-input bounded-output stability of a continuous-time system.(7分) (b) The impulse response $h(t)$ of a given causal linear time-invariant system is known to possess the following two properties: (i) for some real $T > 0$, $h(t+T) = h(t)$ for all $t \geq 0$; (ii) $\int_0^T |h(t)|dt > 0$. Please use the definition stated in part (a) to prove that the above system is not bounded-input bounded-output stable.(13分)
2. A discrete-time sequence $x[n]$ is defined by the formula $x[n] = \sum_{k=-\infty}^{\infty} (u[n-3k] - u[n-3k-3])(-1)^k$, where $u[n]$ denotes the unit step sequence. (a) Please plot the sequence $x[n]$.(5分) (b) Please find the discrete-time Fourier transform of $x[n]$.(15分)
3. Suppose a function $w_k(t)$ is defined recursively in terms of $x(t)$ by the equations $w_k(t) = w_{k-1}(t) * x(t)$ and $w_0(t) = \delta(t)$, where $*$ denotes the convolution operator and $\delta(t)$ denotes the unit impulse function. Suppose $x(t) = 2e^{-2t}u(t)$, where $u(t)$ denotes the unit step function. Please derive a general formula for $w_k(t)$.(20分)
4. The input-output relationship of a LTI system is defined by the differential equation $y''(t) + 2y'(t) + y(t) = x(t)$. (a) Please determine the impulse response of the system.(10分) (b) Please determine the step response of the system. (10分)



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5. Consider the system diagram shown in Fig. P5. The system S is a single-input single-output LTI system with the impulse response $(2+t)e^{-t}u(t)$. (a) Please determine the impulse response of the closed-loop system. (15 分) (b) Please determine the transfer function (system function) of the closed-loop system. (5 分)

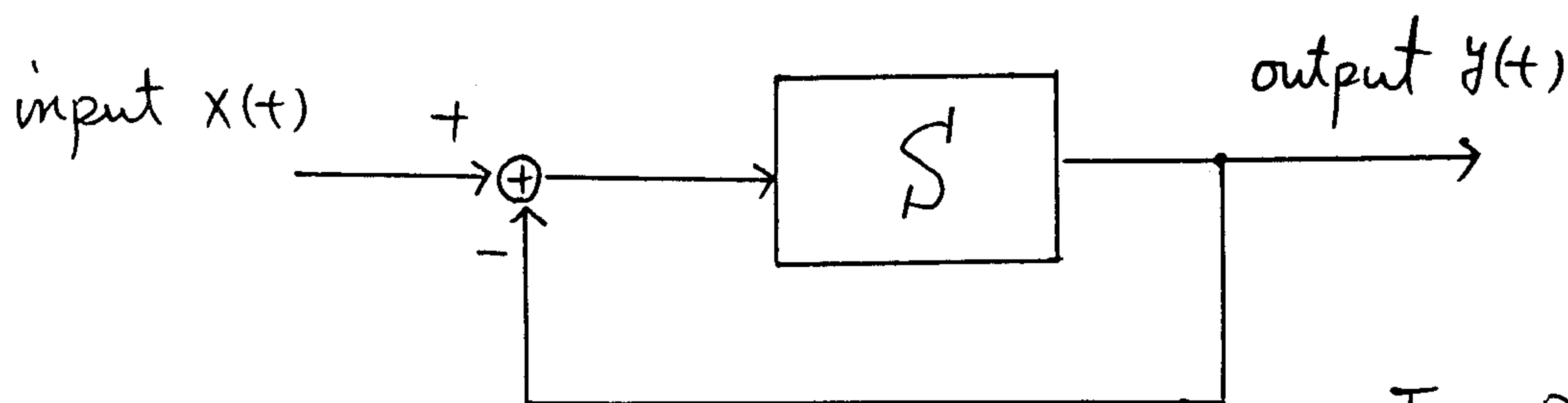


Fig. P5



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