類組：電機類　科目：訊號與系統(300B)　　共 2 頁 第 1 頁

※請在答案卷內作答

一、(5%)

Given a input $x(t)$ output $y(t)$ relation as $y(t) = x(0.5+t) + e^{-|x(0.5-t)|}$. Determine the system is

(a) Memoryless (b) Time invariant (c) Linear (d) Causal (e) Stable

二、(10%)

When the input applied to a continuous LTI system is $x(t)$ in Figure A, the output is $y(t)$ in Figure B. Determine and sketch the output for the input $x'(t)$ shown in Figure C.

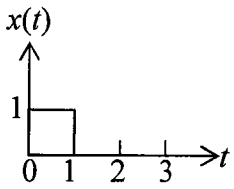


Figure A

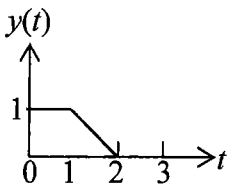


Figure B

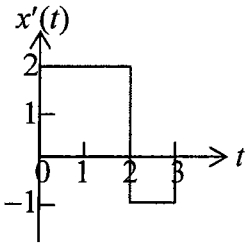


Figure C

參考用

三、(15%)

Given an input $x[n]=\left(\frac{1}{3}\right)^n u[n]$, the output of a DT LTI system is $y[n]=\frac{1}{2}\left(\frac{1}{3}\right)^n u[n]+\frac{1}{4}\left(\frac{1}{6}\right)^n u[n]$

(一) (10%) Find the frequency response (5%) and impulse response (5%) of the system.

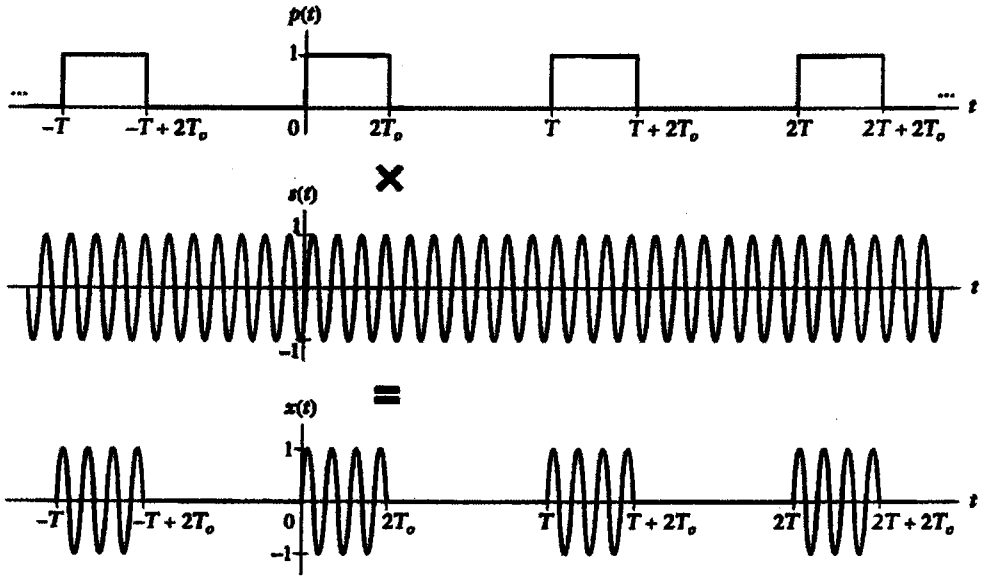
(二) (5%) Find the difference equation relating input and output.

四、(15%)

The RF pulse train $x(t)$ can be defined as the product of a square wave $p(t)$ and a sine wave $s(t)$, as shown in the following figure. Assume that $s(t) = sin(1000\frac{\pi t}{T})$.

(一) (5%) Find the Fourier series coefficient of $p(t)$, and

(二) (10%) Find the Fourier series coefficient of $x(t)$.



注意：背面有試題

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五、(15%)

(一) (5%) Determine the Fourier representation of the following signal

$$x(t) = 2e^{-t}u(t) - 3e^{-2t}u(t)$$

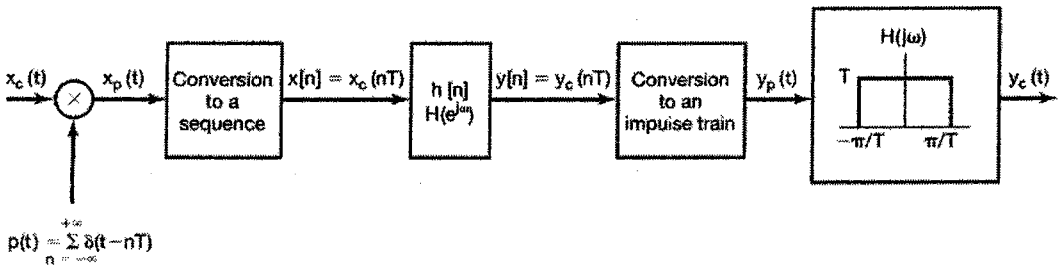
(二) (10%) Find the time-domain signals corresponding to the following Fourier transform representations:

(5%) $X(e^{j\Omega}) = \frac{1}{1-\alpha e^{-j(\Omega+\frac{\pi}{4})}}$, $|\alpha| < 1$

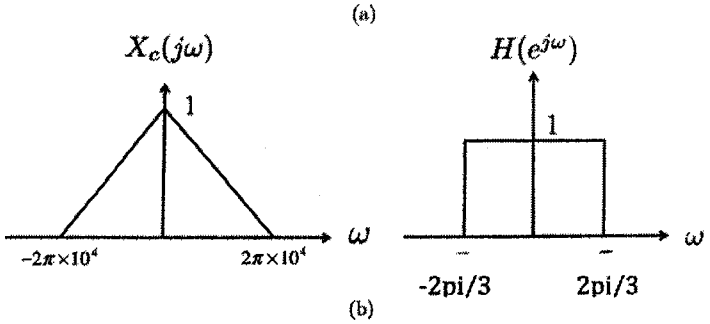
(5%) $Y(jw) = \frac{1}{2+j(w-3)} + \frac{1}{2+j(w+3)}$

六、(15%)

Panel (a) shows the overall system for processing a Continuous-Time (CT) signal using a Discrete-Time (DT) system. If $X_c(j\omega)$ and $H(e^{j\omega})$ are as shown in panel (b) and $1/T$ =15 kHz, sketch $X_p(j\omega)$, $X(e^{j\omega})$, $Y(e^{j\omega})$, $Y_p(j\omega)$, and $Y_c(j\omega)$.



(a)



(b)

七、(10%)

A causal LTI system has an impulse response $h(t)$ that satisfies the differential equation

$$\frac{dh(t)}{dt} + 3h(t) = e^{-4t}u(t) + ce^{-5t}u(t),$$

where c is a constant. Moreover, the system output is $(2/15)e^t$ when the input to the system is e^t.

(一) (3%) Determine the constant c.

(二) (3%) If the transfer function of this system is $H(s)$, find its poles.

(三) (4%) Specify the region of convergence of $H(s)$ and tell whether or not the system is stable.

八、(15%)

If the input to an LTI system is $u[n]$, the output is $y[n] = (1/2)^{n-1}\, u[n]$.

(一) (6%) If $H(z)$ is the z-transform of the system impulse response, find its pole, zero, and the region of convergence.

(二) (5%) Find the impulse response $h[n]$ of this LTI system.

(三) (4%) Is the system stable? Is the system causal?