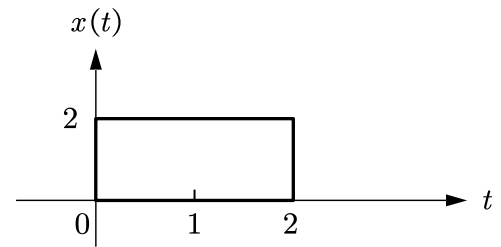


通訊系統導論 Quiz 3 級別：\_\_\_\_\_ 學號：\_\_\_\_\_ 姓名：\_\_\_\_\_

Q1. Given a signal  $x(t) = 2\Pi\left(\frac{t-1}{2}\right)$  shown in Fig. 1, determine

- the Fourier transform  $X(f)$ ;
- the energy spectral density (ESD)  $\Psi_x(f)$ ;
- the autocorrelation function  $R_x(\tau)$ ;
- the DC value;
- the total energy  $E_x$ ;
- Is  $x(t)$  a power or an energy signal? Why?



答案填入右下角的【答案欄】

- $X(f) = 4\text{sinc}(2f)e^{-j2\pi f}$
- $\Psi_x = |X(f)|^2 = 16\text{sinc}^2(2f)$
- $R_x(\tau) = \mathfrak{F}^{-1}\{\Psi_x\} = 8\Lambda\left(\frac{\tau}{2}\right)$
- DC value =  $2 \times 2 = 4$  (V)
- The total energy =  $R_x(0) = 8$  (joule)
- Since  $E_x = 8 < \infty$ ,  $x(t)$  is an energy signal.

Answers	
(a)	$4\text{sinc}(2f)e^{-j2\pi f}$
(b)	$16\text{sinc}^2(2f)$
(c)	$8\Lambda\left(\frac{\tau}{2}\right)$
(d)	4
(e)	8
(f)	An energy signal, $\because E_x = 8 < \infty$