

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Consider the series RLC in Fig 1. Please find the input/output differential equation when the following conditions are met.

- a. The output is the voltage $V_C(t)$ across the capacitor. (15%)
- b. The output is the current $i(t)$ in the loop. (15%)

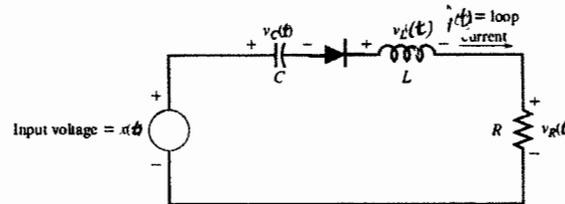


Figure 1

2. For the continuous-time signals $x(t)$ and $v(t)$ shown in Figs 2, compute the convolution $x(t) * v(t)$ for all $t \geq 0$, and plot your resulting signal. (15%)

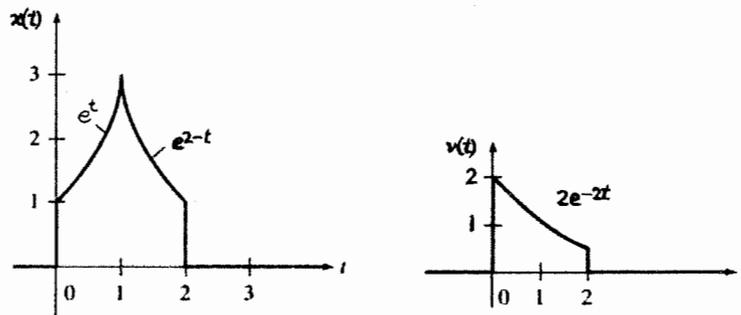


Figure 2

3. Consider the rectangular pulse train shown in Figure 3. This signal is periodic with fundamental period $T=3$. Please find the trigonometric Fourier series (15%).

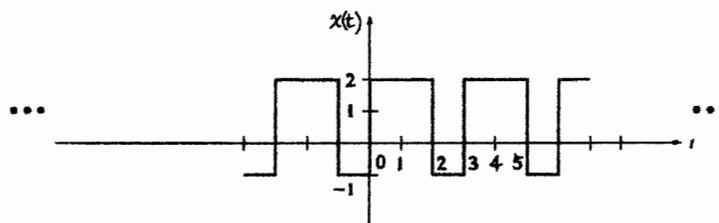


Figure 3

4. Compute the DFT of the discrete-time signals shown in Fig. 4. (15%)

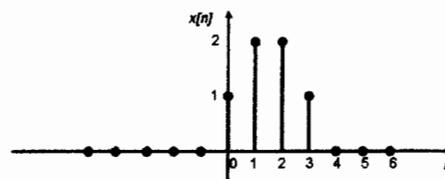


Figure 4.

5. Compute the DTFT of the following discrete time signals. Plot the amplitude and the phase spectrum for the signal. $x[n] = (0.5)^n \cos 4\pi n$. (15%)

6. Given two discrete-time signals $x[n]$ and $v[n]$, and $X(z)$ and $V(z)$ are its corresponding z-transform, please prove that $x[n] * v[n] = X(z)V(z)$? (10%)