※ 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 a 5-point exponentially weighted moving average filter and an input signal $x[n]$. Please find and plot the output signals $y[n]$. if $a = \dfrac{1-b}{1-b^N}$, and $b=0.4$(10%)

$$y[n] = \sum_{i=0}^{N-1} a(b^i x[n-i])$$

2. Consider the series RLC in Fig 1. Please use the s-domain representation to compute the transfer function for each component. (10%)
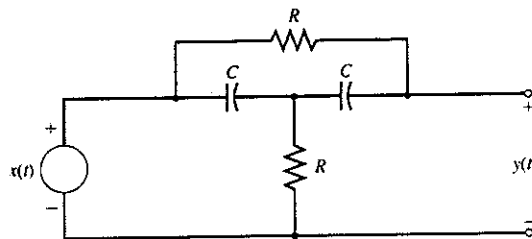

Figure 1

3. For the continuous-time signals $x(t)$ and $v(t)$ shown in Fig 2 , compute the convolution $x(n) * v(v)$ for all $t \geq 0$, and plot your resulting signal. (10%)
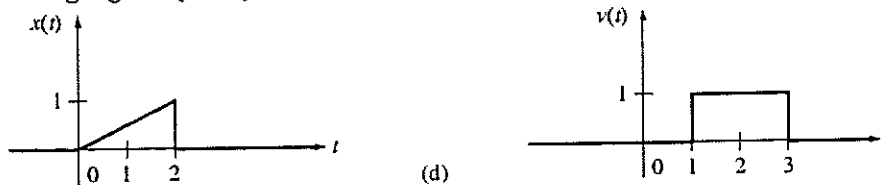

Figure 2

4. Consider the discrete-time system shown in Figure 3.
    a) Determine the transform function $H(z)$ of the system?(10%)
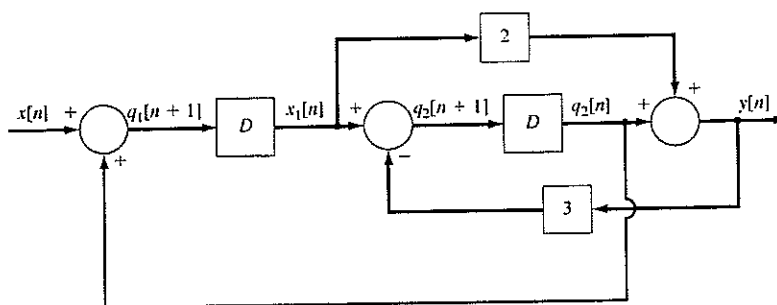   b) Compute the output response $y[n]$ when $x[n]=4u[n]$ with zero initial conditions. (10%)

Figure 3

5. Compute the Fourier transform of the following signals, (20%)
    a.　$x(t)=(e^{-t}cos4t)u(t)$
    b.　$x(t)=te^{-t}u(t)$

6. Suppose the Laplace transform of $x(t)$ is $X(s) = \dfrac{s+1}{s^2 + 5s + 7}$, please determine the Laplace transform $V(s)$ of the following signals (20%)
    a.　$v(t)= e^{-3t} x(t)$
    b.　$v(t)=x(t)* x(t)$

7. A discrete-time signal x[n] has z-transform $X(z) = \dfrac{z+1}{z(z-1)}$, compute x[0], x[10], and x[1000]?(10%)