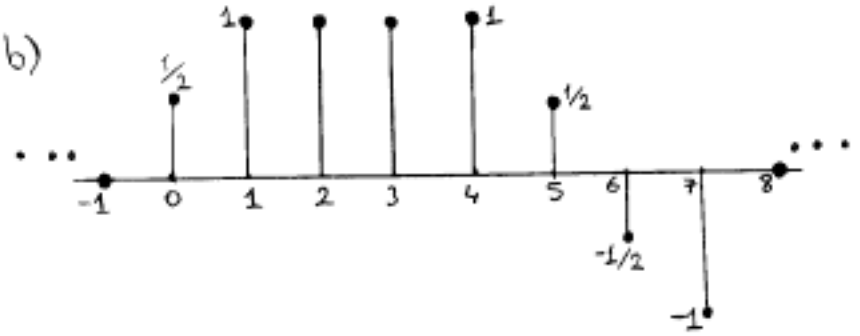
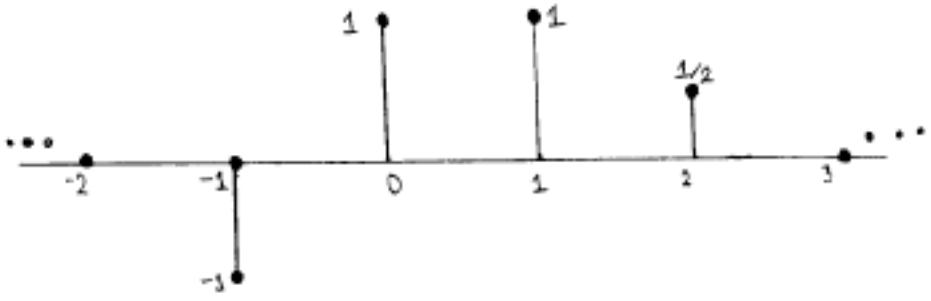
EE32 Problem Set 1 – Solutions:

2 - b)



c)

h)



Problem 4:

d) $y[n] = \varepsilon v\{x[n-1]\} = \frac{1}{2}\{x[n-1] + x[1-n]\}$

1- System is **not memoryless:** $y[n]$ depends on the future for $n < 0$.

2- System is **not time invariant**: $y[n-\delta] = \frac{1}{2}\{x[n-1-\delta] + x[1-n+\delta]\}$. However, if we define $x[n-\delta] = x'[n]$ and have this as an input

$$y'[n] = \varepsilon v\{x'[n-1]\} = \frac{1}{2}\{x'[n-1] + x'[1-n]\} = \frac{1}{2}\{x[n-1-\delta] + x[1-n-\delta]\} \neq y[n-\delta]$$

3- System is **linear**: εv function is obviously linear and the time delay is linear, too.

4- System is **not causal**: $y[n]$ depends on the future for $n < 0$.

5- System is **stable**: $y[n] = \frac{1}{2}\{x[n-1] + x[1-n]\}$ will be stable if $x[n-1] \& x[1-n]$ are both stable.

e) $$y[n] = \begin{cases} x[n] \rightarrow n > 0 \\ 0 \rightarrow n = 0 \\ x[n+1] \rightarrow n < 1 \end{cases}$$

1- System is **not memoryless:** $y[n]$ depends on the future for $n < 0$.

2- System is **not time invariant**: location of origin is important

3- System is **linear**: all the components of the function are linear.

4- System is **not causal**: $y[n]$ depends on the future for $n < 0$.

5- System is **stable**: $y[n]$ will be stable if $x[n] \& x[n+1]$ are both stable.

f) $$y[n] = \begin{cases} x[n] \rightarrow n > 0 \\ 0 \rightarrow n = 0 \\ x[n] \rightarrow n < 1 \end{cases}$$

1- System is **memoryless:** $y[n]$ depends only on current time.

2- System is **not time invariant**: location of origin is important.

3- System is **linear**: all the components of the function are linear.

4- System is **causal**: the system is memoryless.

5- System is **stable**: $y[n]$ will be stable if $x[n]$ is stable.