EEE 5502 HW #03 Hudanyun Sheng

Question #1

I spent 3 hours.

Question #2

(a) $h[n] = H\{\delta[n]\} = \frac{1}{3}(\delta[n+1] + \delta[n] + \delta[n-1])$

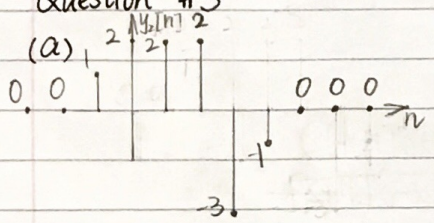
(b) $h[n] = \frac{1}{3}(\delta[n+1] + 2\delta[n-2] - \delta[n-5] + \delta[n] + 2\delta[n-3] - \delta[n-6] + \delta[n-1] + 2\delta[n-4] - \delta[n-7])$

$= \frac{1}{3}(\delta[n+1] + \delta[n] + \delta[n-1] + 2\delta[n-2] + 2\delta[n-3] + 2\delta[n-4] - \delta[n-5] - \delta[n-6] - \delta[n-7])$

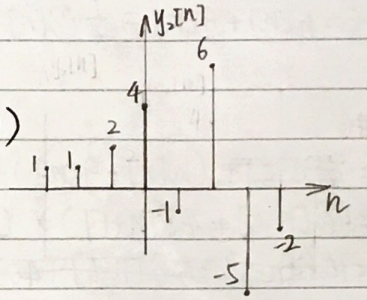
(c) This system calculates the average value of the past, current and future signal.

Question #3

(a)

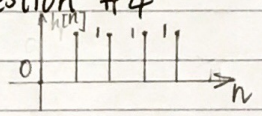


(b)



Question #4

(a)



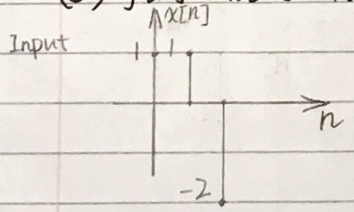
(b) The LTI system defined by h[n] is causal

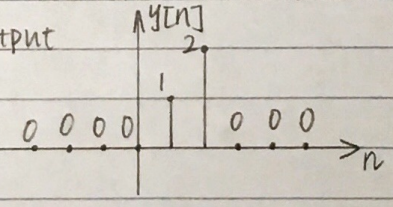
Because $h[n] = u[n-1] = 0$ for $n<0$, $\therefore$ h[n] is causal $\therefore$ The system is causal.

(c) The system is not memoryless. Because h[n] cannot be expressed as $A\delta[n]$.

(d) The system is not BIBO stable. Because $\sum_{n=-\infty}^{\infty} |h[n]| \to \infty$. $\therefore$ The system is not BIBO stable

(e) $y[n] = x[n] * h[n] = (\delta[n] + \delta[n-1] - 2\delta[n-2]) * h[n]$



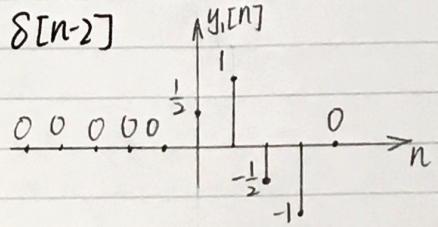


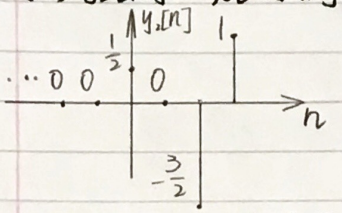
Question #5

(a) $x[n] = \delta[n] + \delta[n-1] - 2\delta[n-2]$

(b) $y_1[n] = x[n] * h[n]$

(c) $y_2[n] = x[n] * g[n]$



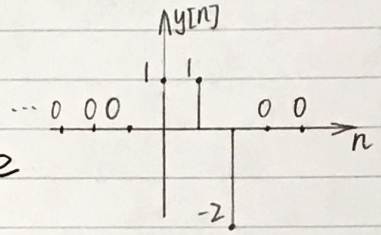


(d) $y[n] = y_1[n] + y_2[n]$

(e) Let H denote the complete system. we have

$H\{\delta[n]\} = h[n] + g[n]$

$= \frac{1}{2}(\delta[n] + \delta[n-1] + \delta[n] - \delta[n+1] = \delta[n]$



Question #6

(a) $p[n] = (h[n] + g[n]) * r[n]$

$= (\delta[n-5] + 4\delta[n+1]) * (10\delta[n] + 5\delta[n-1])$

$= 10\delta[n-5] + 5\delta[n-6] + 40\delta[n+1] + 20\delta[n]$

(b) The system is not causal. Because the impulse response for the system is not causal. (for $n<0$, we have $p[n] = 40$ when $n=-1$)

(c) The LTI system defined by $p[n]$ is not memoryless. Because $p[n]$ cannot be expressed as $A\delta[n]$.

(d) The system is BIBO stable. Because $\sum_{n=-\infty}^{\infty} |h[n]| < \infty$.