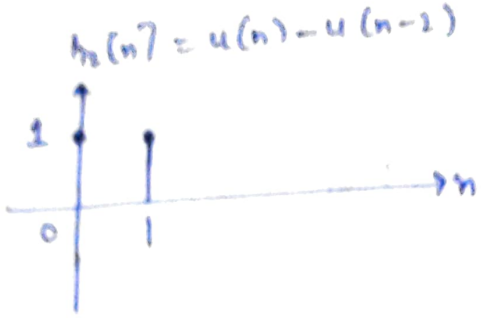
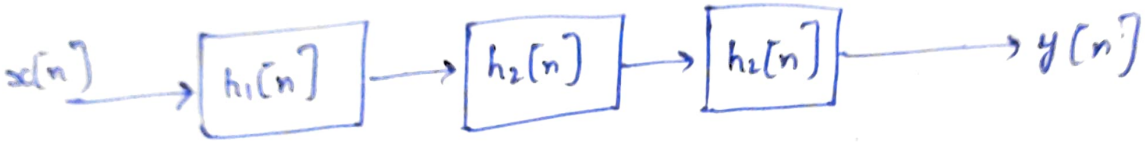
Sol:

$$h_2[n] = u[n] - u[n-2]$$



$$h_2[n] = \delta[n] + \delta[n-1]$$ ——— (1) mark.

Now,



$$y[n] = x[n] * h[n]$$

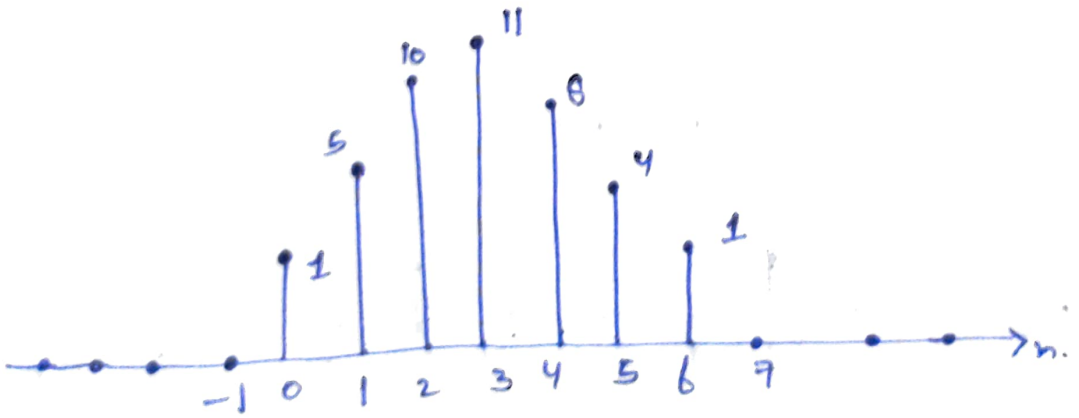
$$h[n] = h_1[n] * [h_2[n] * h_2[n]]$$

$$h[n] = h_1[n] * [[\delta(n) + \delta(n-1)] * [\delta[n] + \delta[n-1]]$$ ——— (1) mark

$$h[n] = h_1[n] * [\delta(n) + 2\delta(n-1) + \delta(n-2)]$$

$$h[n] = h_1[n] + 2h_1[n-1] + h_1[n-2]$$ ——— (1) mark.

Overall impulse response



$$h[0] = h_1[0] + 2h_1[-1] + h_1[-2]$$

$$1 = h_1[0]$$

$h[1] = h_1[1] + 2h_1[0]$

$5 = h_1[1] + 2(1)$

$\boxed{h_1[1] = 3}$

$h[2] = h_1[2] + 2h_1[1] + h_1[0]$

$10 = h_1[2] + 2[3] + 1$

$\boxed{h_1[2] = 3}$

$h[3] = h_1[3] + 2h_1[2] + h_1[1]$

$11 = h_1[3] + 6 + 3$

$\boxed{h_1[3] = 2}$

$h[4] = h_1[4] + 2h_1[3] + h_1[2]$

$8 = h_1[4] + 4 + 3$

$\boxed{h_1[4] = 1}$

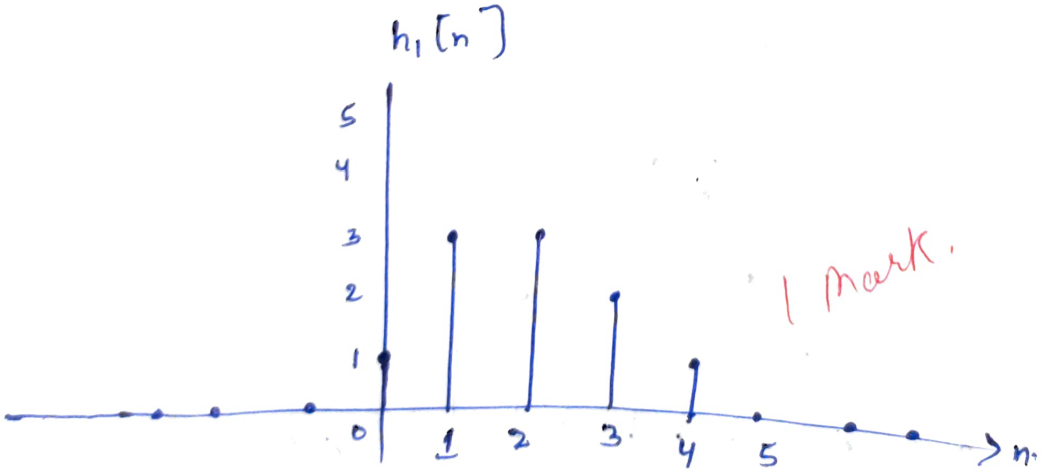
$h[5] = h_1[5] + 2h_1[4] + h_1[3]$

$4 = h_1[5] + 2 + 2$

$\boxed{h_1[5] = 0}$

3 marks.

$h_1[n] = 0$ for $n < 0$ & $n \geq 5$



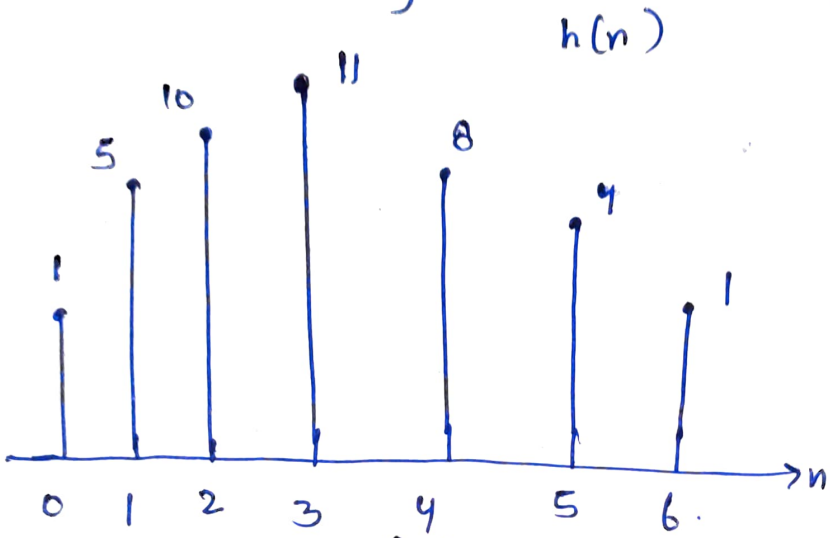
1 mark.

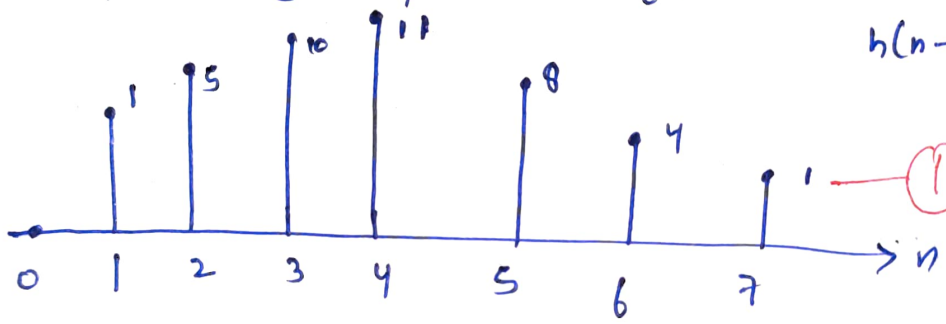
(b) $x(n) = \delta(n) - \delta(n-1)$

$y(n) = x(n) * h(n)$

$= [\delta(n) - \delta(n-1)] * [h(n)]$

$= h(n) - h(n-1)$ — (1) mark.



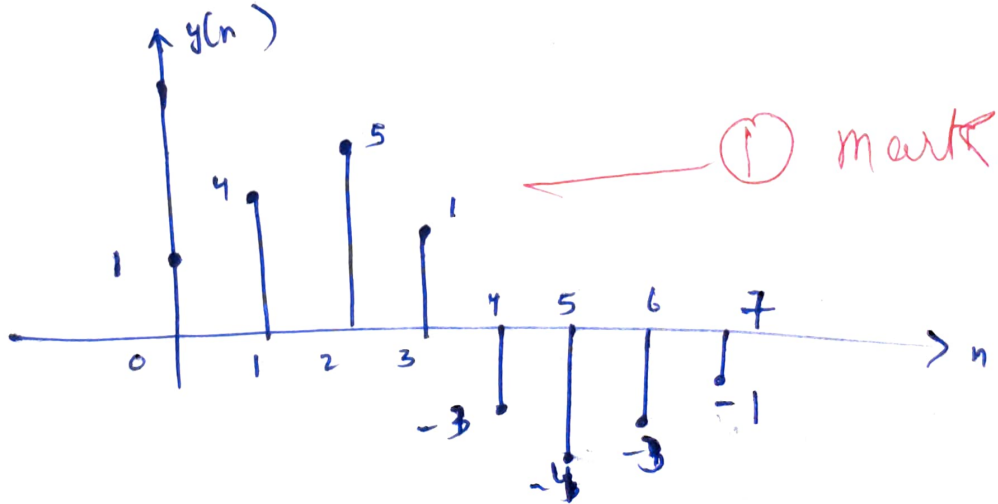


(1) mark.

$y(n) = h(n) - h(n-1)$

$= \{1, 4, 5, 1, -3, -4, -3, -1\}$.

$y(n=0)$



(1) mark.