

$$\frac{2021}{2.2} \quad x(n) = \begin{Bmatrix} \overset{x(1)}{1}, \underset{x(0)}{0}, \underset{x(2)}{1}, \overset{x(3)}{1} \end{Bmatrix}$$

$$h(n) = a^n u(n), \quad |a| < 1$$

↓ impulse response

$$\text{Convolution, } y(n) = x(n) * h(n)$$

$$= \sum_{k=-\infty}^{\infty} x(k) h(n-k)$$

$$u(n) = \begin{cases} 1 & n \geq 0 \\ 0 & n < 0 \end{cases}$$

$$h(n) = a^n u(n)$$

$$n=0, \quad h(0) = a^0 u(0) = 1$$

$$n=1, \quad h(1) = a^1 u(1) = a$$

$$n=2, \quad h(2) = a^2 u(2) = a^2$$

$$n=3, \quad h(3) = a^3 u(3) = a^3 \dots$$

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

$$y(n) = \sum_{k=0}^3 x(k) h(n-k)$$

$$x(n) = 1, 0, 1, 1$$

$$h(n) = 1, a, a^2, a^3$$

$$h(-n) = a^3, a^2, a, 1$$

$x(n)$ $h(n)$	1	0	1	1
1	1	0	1	1
a	a	0	a	a
a^2	a^2	0	a^2	a^2
a^3	a^3	0	a^3	a^3

$$y(n) = \{1, a, a^4 + 1, a^3 + a + 1, a^2 + a, a^3 + a^2, a^3\}$$

(Ans)