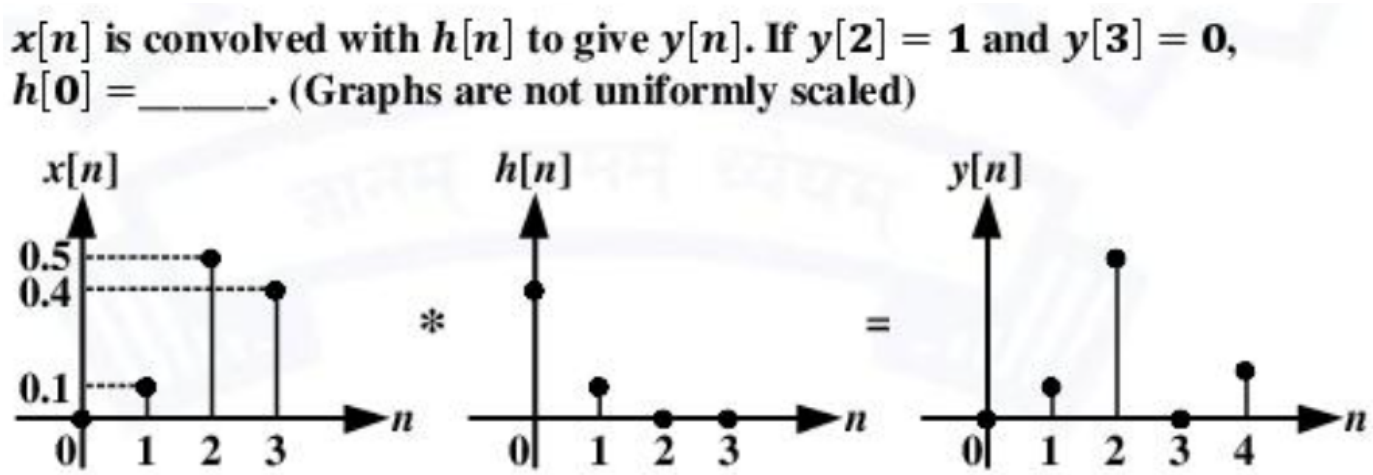
EE23BTECH11209 - K S Ballvardhan*

Question: x[n] is convolved with h[n] to give y[n]. If y[2] = 1 and y[3] = 0 then find h[0]. (Graphs are not uniformly scaled) [GATE BM 2021]



Solution:

Parameter	Value	Description
$x(1)$	0.1	$x(n)$
$x(2)$	0.5	$x(n)$
$x(3)$	0.4	$x(n)$
$h(2)$	0	$h(n)$
$h(3)$	0	$h(n)$
$y(2)$	1	$y(n)$
$y(3)$	0	$y(n)$

TABLE I
INPUT VALUES

By convolution we know that,

$$y(n) = (x * h)(n) = \sum_{n=-\infty}^{\infty} x(k) \cdot h(n-k) \tag{1}$$

$$\implies y(2) = 0.5h(0) + 0.1h(1) \tag{2}$$

$$\implies y(3) = 0.4h(0) + 0.5h(1) \tag{3}$$

From the values in Table I:

$$y(2) = 0.5h(0) + 0.1h(1) = 1 \tag{4}$$

$$y(3) = 0.4h(0) + 0.5h(1) = 0 \tag{5}$$

By solving equations (4) and (5) we get,

$$5 = 2.1h(0) \tag{6}$$

$$\implies h(0) = \frac{5}{2.1} \tag{7}$$

$$\therefore h(0) = 2.38 \tag{8}$$