

Q1.

(Answer)

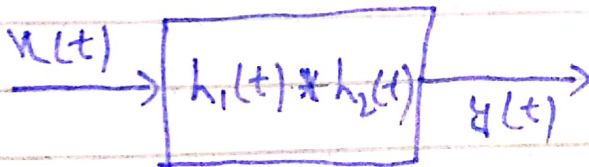
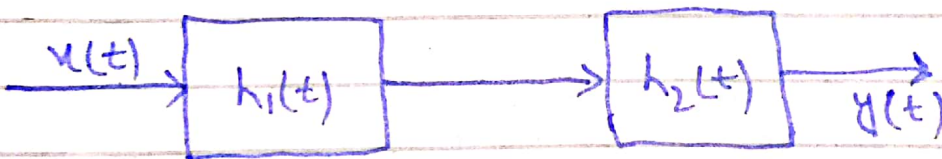
Associative Property:

Convolution is associative, so if we have ~~two~~ ³ signals $x_1(t)$ and $x_2(t)$ and $x_3(t)$

~~$x_1(t) * x_2(t) * x_3(t)$~~

$$x_1(t) * (x_2(t) * x_3(t)) = (x_1(t) * x_2(t)) * x_3(t)$$

USE IN LTI SYSTEMS:



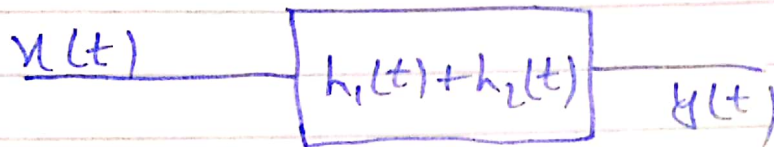
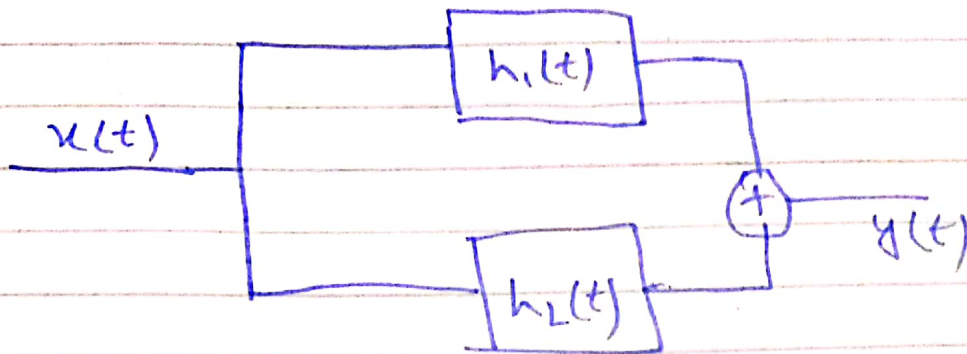
Distributive Law:

Convolution is also distributive, so if we have 3 signals $x(t)$, $h_1(t)$ and $h_2(t)$ then

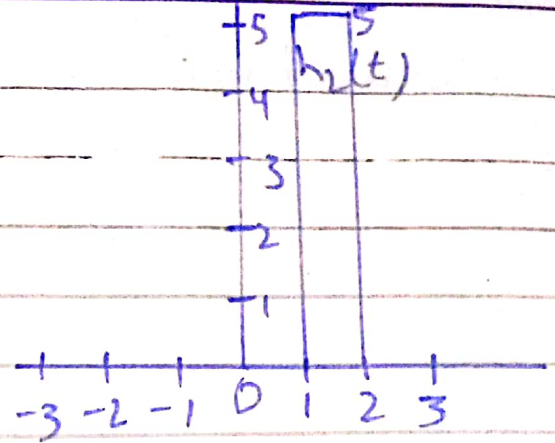
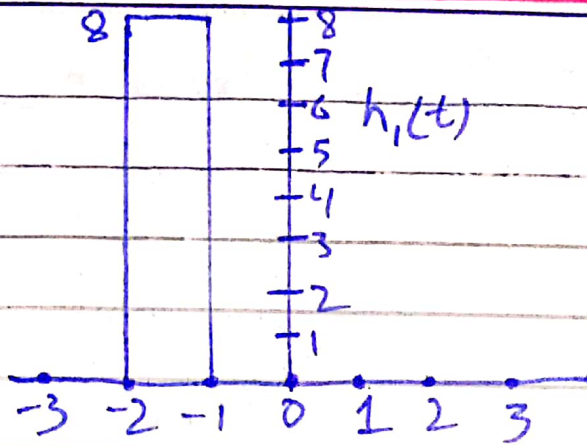
$$x(t) * (h_1(t) + h_2(t)) = x(t) * h_1(t) + x(t) * h_2(t)$$

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USE IN LTI SYSTEMS:

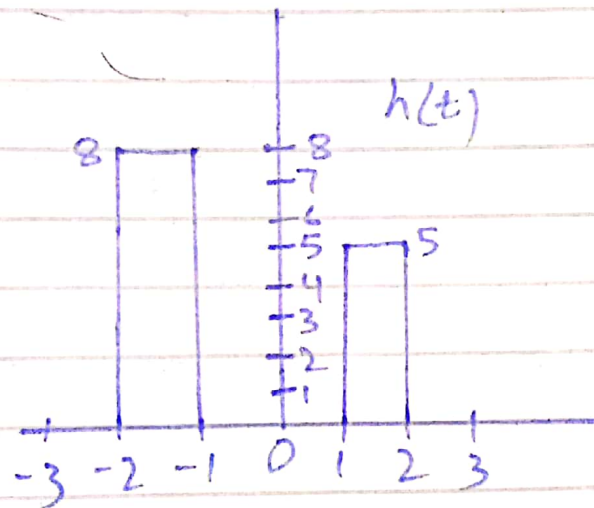


(2)



(i) Parallel:

$$\text{impulse response} = h_1(t) + h_2(t)$$

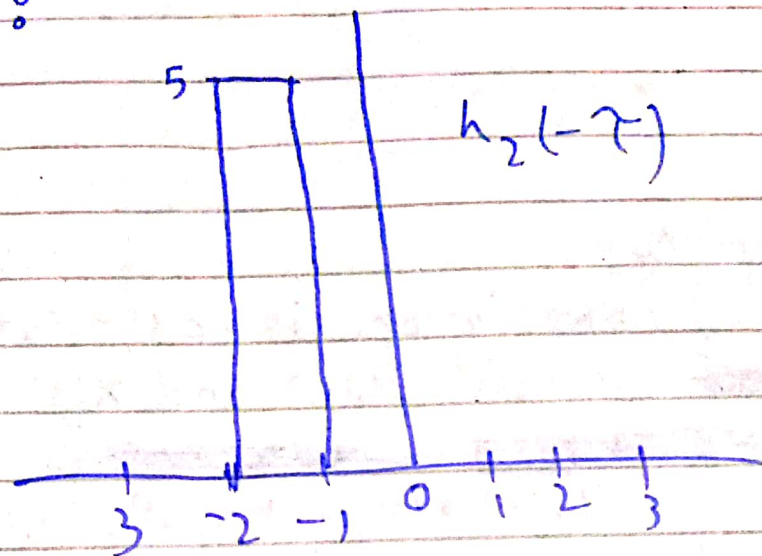


(ii) Series:

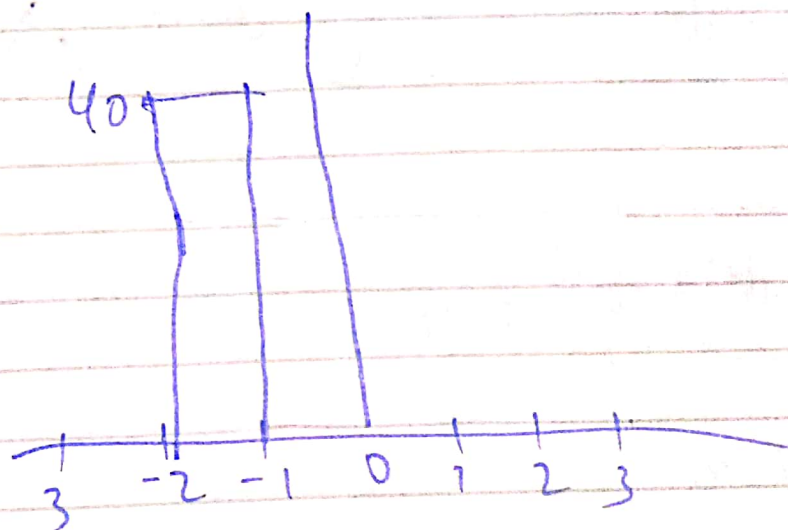
$$h(t) = h_1(t) * h_2(t)$$

$$= \int_{-\infty}^{\infty} h_1(\tau) h_2(t-\tau) d\tau$$

$$h_2(-\tau):$$



$$h(\tau) = h_1(\tau) h_2(-\tau)$$



$$h_2(1-\tau)$$