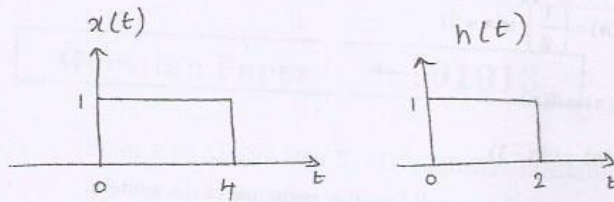


13. (a) Convolve the following signals.

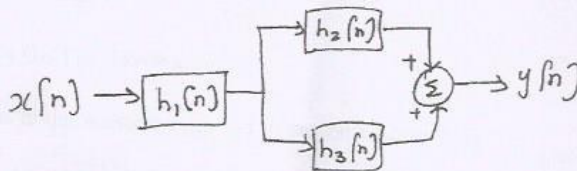


Or

- (b) The transfer function of a causal system is given by $H(s) = \frac{1}{s^2 + 2s - 15}$ find the impulse response and the differential equation representation of the system.
14. (a) Find the Fourier transform of $x(n) = (0.5)^{|n|}$ and plot the spectrum.
Or
(b) Find the z-transform of $x(n) = (0.75)^n u(-n-1) + (0.9)^n u(n-1)$ and its associated ROC.
15. (a) The input-output relationship of a causal discrete-time system is represented by the following difference equation
- $$y(n) - 3y(n-1) + 2y(n-2) = x(n) - x(n-1)$$
- Find the impulse response $h(n)$ of the system using z - transform.
Or
(b) Given $0.3(0.5)^n u(n)$ is the impulse response $h(n)$ of a system. Find the frequency response $H(e^{j\omega})$ and the difference equation representation of the system. Also determine whether it is a recursive or non recursive system.

PART C — (1 × 15 = 15 marks)

16. (a) Consider the interconnection of LTI systems shown below



Given

$$h_1(n) = \left(\frac{1}{2}\right)^n u(n+2)$$

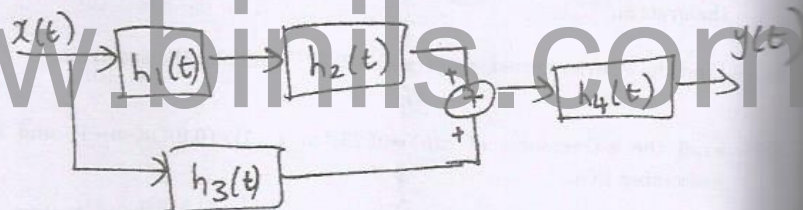
$$h_2(n) = \delta(n)$$

$$h_3(n) = u(n-1)$$

Determine the overall impulse response of the system.

Or

(b) Consider the interconnection of LTI systems shown below.



Given

$$h_1(t) = e^{-t} u(t)$$

$$h_2(t) = \delta(t)$$

$$h_3(t) = 2\delta(t+1)$$

$$h_4(t) = e^{-t} u(t)$$

Determine the overall impulse response of the system