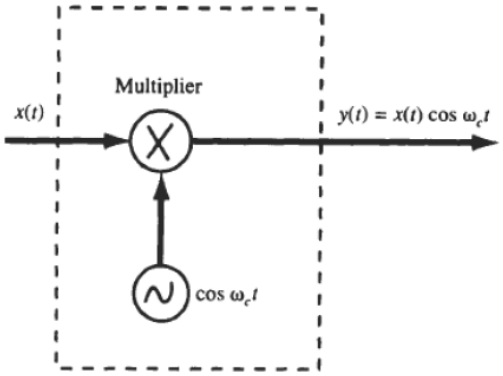
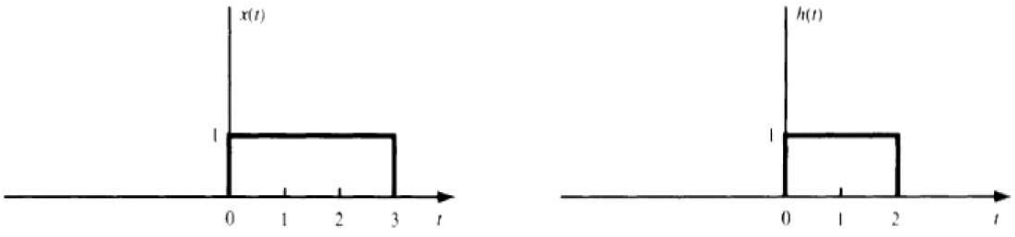
UEC-404 Signals & Systems

Tutorial #6

[1]	Determine whether the following systems are causal? (i) $y(t) = \mathbf{T}\{x(t)\} = x(t) + 2\,x(3 - t)$ (ii) $y(t) = \mathbf{T}\{x(t)\} = t\,x(t)$ (iii) $y(t) = \mathbf{T}\{x(t)\} = x(t^2)$ (iv) $y(t) = \mathbf{T}\{x(t)\} = x(2t)$
[2]	Determine whether the following systems are linear? (i) $y(t) = \mathbf{T}\{x(t)\} = x^2(t)$ (ii) $y(t) = \mathbf{T}\{x(t)\} = x(t^2)$ (iii) $y[n] = \mathbf{T}\{x[n]\} = x[n-1]$ (iv) $y[n] = \mathbf{T}\{x[n]\} = nx[n]$
[3]	Determine whether the following systems are time-invariant? (i) $y(t) = \mathbf{T}\{x(t)\} = x^2(t)$ (ii) $y(t) = \mathbf{T}\{x(t)\} = x(t^2)$ (iii) $y[n] = \mathbf{T}\{x[n]\} = x[n-1]$ (iv) $y[n] = \mathbf{T}\{x[n]\} = nx[n]$
[4]	Consider the system shown in Figure. Determine whether it is (a) memoryless, (b) causal, (c) linear, (d) time-invariant. 
[5]	Evaluate $y(t) = x(t) * h(t)$, where $x(t) = u(t) - u(t-3)$ and $h(t) = u(t) - u(t-2)$ (a) by an analytical technique, and (b) by a graphical method. 
[6]	Let $x[n] = \delta[n] + 2\delta[n-1] - \delta[n-3]$ and $h[n] = 2\delta[n+1] - 2\delta[n-1]$

	Compute and plot each of the following convolutions: (a) $y_1[n] = x[n] * h[n]$ (b) $y_2[n] = x[n + 2] * h[n]$ (c) $y_3[n] = x[n] * h[n + 2]$
[7]	Consider an LTI system with input x[n] and unit impulse response h[n] specified as follows: $x[n] = 2^n u[-n]$ $h[n] = u[n]$ Compute and plot the convolution $y[n] = x[n] * h[n]$.