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1.1

1) $y(t) = u(t + A)$

+ $A > 0$: the system is not causal because $y(t)$ depend on future input

+ $A \leq 0$: the system is causal

2) $y(t) = u(t^{2+B})$

+ $B = -1$: the system is causal

+ $B \geq 0$: the system is not causal because $y(t)$ depend on future input

+ $B < -2$: the system is not causal because $y(t)$ depend on future input for $t = 0$

3) $y[n] = 0.5 u[n] + 0.5 u[n-C]$; $n \geq 0$

+ $C \geq 0$: the system is causal

+ $C < 0$: the system is not causal because $y[n]$ depend on future input

4) $y[n] = 0.25 u[n-1] + 0.25 u[n+2D]$; $n \geq 0$

+ $D \leq 0$: the system is causal

+ $D > 0$: the system is not causal because $y[n]$ depend on future input

1.2

* A system is memoryless if the output at time t_0 only depends on the input at time t_0

* The above system is not memoryless because the output voltage of capacitor at time t_0 depends on the past current:

$$u(t) = R\,i(t) + v(t)$$

$$= R.C.\frac{dv(t)}{dt} + v(t)$$

$$\Rightarrow v(t) = u(t) - R.C.\frac{dv(t)}{dt}$$