Serial # 2

-1 points for not writing your serial #

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE207: Signals & Systems (122)
Quiz 3: Convolution
Dr. Ali Hussein Muqaibel

Name: KEY   Ver.2

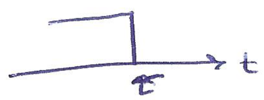
Consider a system with impulse response $h(t) = u(t-2)$

a) Using the convolution integral, find the system response, $y(t)$, to the input,
$$x(t) = e^{-2t}u(t)$$

$$y(t) = \int_{-\infty}^{\infty} h(\tau)\,x(t-\tau)\,d\tau$$

$$= \int_{-\infty}^{\infty} u(\tau-2)\, e^{-2(t-\tau)}\, u(t-\tau)\,d\tau$$

$u(t-\tau)$

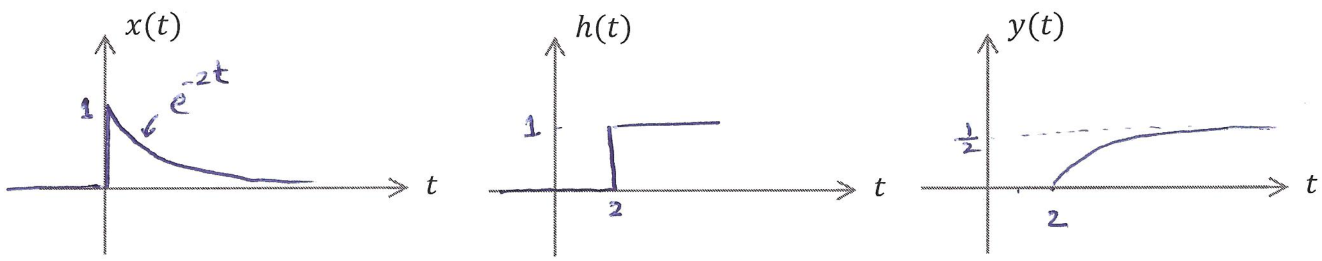


$$= \int_{2}^{\infty} e^{-2(t-\tau)}\, u(t-\tau)\,d\tau$$

$$= \begin{cases} 0 & t<2 \\ \int_{2}^{t} e^{-2(t-\tau)}\,d\tau & t>2 \end{cases} = \begin{cases} 0 & t<2 \\ \frac{1}{2} e^{-2(t-\tau)}\Big|_{2}^{t} & t>2 \end{cases}$$

$$= \begin{cases} 0 & t<2 \\ \frac{1}{2}\left[1-e^{-2(t-2)}\right] & t>2 \end{cases} = \boxed{\frac{1}{2}\left[1-e^{-2[t-2]}\right]u(t-2)}$$

b) Sketch $x(t)$, $h(t)$ and $y(t)$. Discuss any indication from the sketch that $y(t)$ is correct!



Start of $y(t)$ = start of $x(t)$ + start of $h(t)$ $= 0 + 2 = 2$ ✓
end + end $= \infty + \infty = \infty$ ✓

Area $= \infty \cdot \infty = \infty$

Alternatively we can find the step response $= \int_{-\infty}^{t} h(\tau)\,d\tau$ & $s(t) = \frac{1}{2}\left[1-e^{-2t}\right]u(t)$
delay it by two units $s(t-2) = \frac{1}{2}\left[1-e^{-2(t-2)}\right]u(t-2)$ ✓

Good luck, Dr. Ali Muqaibel