SOLUTIONS: Assignment 2 EEE2035F 2008

1) 1.

$$2u(t) \longrightarrow 4(1-e^{-t})u(t)$$
$$-2u(t-1) \longrightarrow -4(1-e^{-(t-1)})u(t-1)$$
$$\underbrace{2u(t)-2u(t-1)}_{x(t)} \longrightarrow \underbrace{4(1-e^{-t})u(t)-4(1-e^{-(t-1)})u(t-1)}_{y(t)}$$

2.

$$\underbrace{4\cos(2(t-2))}_{x(t)} \longrightarrow \underbrace{4\sqrt{2}\cos[(t-2)+\pi/4]}_{y(t)}$$

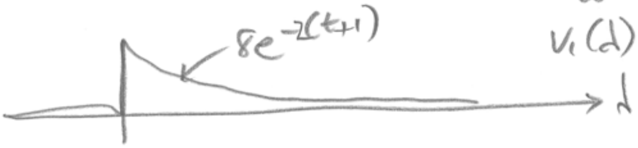
3.

$$5u(t) \longrightarrow 10(1-e^{-t})u(t)$$
$$10\cos(2t) \longrightarrow 10\sqrt{2}\cos(t+\pi/4)$$
$$\underbrace{5u(t)+10\cos(2t)}_{x(t)} \longrightarrow \underbrace{10(1-e^{-t})u(t)+10\sqrt{2}\cos(t+\pi/4)}_{y(t)}$$

2)

$$\dot{w}(t) = \dot{x}(t) * v(t) = [2\delta(t+1) - 2\delta(t-3)] * v(t)$$
$$= \underbrace{2v(t+1)}_{v_1(t)} - \underbrace{2v(t-3)}_{v_2(t)}$$
$$= v_1(t) + v_2(t)$$

so $w(t) = \int_{-\infty}^{t} \dot{w}(\lambda)\,d\lambda = \int_{-\infty}^{t} v_1(\lambda)\,d\lambda + \int_{-\infty}^{t} v_2(\lambda)\,d\lambda.$



$$\int_{-\infty}^{t} v_1(\lambda)\,d\lambda = \begin{cases} 0 & \text{for } t<0 \\ \int_0^t 8e^{-2(\lambda+1)}\,d\lambda & \text{for } t\geq 0 \end{cases}$$
$$= \begin{cases} 0 & \text{for } t<0 \\ 4e^{-2}(1-e^{-2t}) & \text{for } t\geq 0 \end{cases}$$
$$= 4e^{-2}(1-e^{-2t})\,u(t)$$

$$\int_{-\infty}^{t} v_2(\lambda)\,d\lambda = \begin{cases} 0 & \text{for } t<4 \\ \int_4^t -8e^{-2(\lambda-3)}\,d\lambda & \text{for } t\geq 4 \end{cases}$$
$$= \begin{cases} 0 & \text{for } t<4 \\ 4e^{6}(e^{-2t}-e^{-8}) & \text{for } t\geq 4 \end{cases}$$
$$= 4e^{6}(e^{-2t}-e^{-8})\,u(t-4)$$

So $w(t) = \underline{4e^{-2}(1-e^{-2t})u(t) + 4e^{6}(e^{-2t}-e^{-8})u(t-4)}$