

GEORGIA INSTITUTE OF TECHNOLOGY
SCHOOL OF ECE
EE 2201B

SOLUTIONS TO QUIZ #1

①

System I: $y(t) = \int_{t-5}^{t+1} x(\tau) \cos(10\pi\tau) d\tau$

System II: $y(t) = \frac{d}{dt} \{e^{-t}x(t)\}$

	System I	System II
Memoryless	NO	NO
Causal	NO	YES
Stable	YES	NO
Linear	YES	YES
Time-Invariant	NO	NO

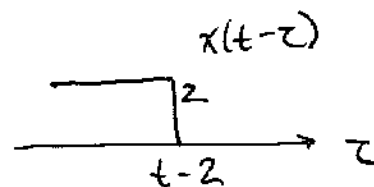
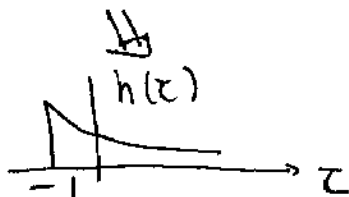
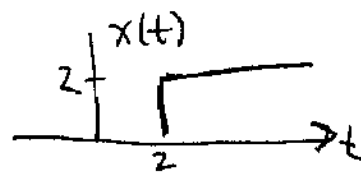
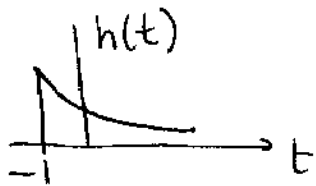
② (a) For causality we need $h(t) = 0$ for $t < 0$.
 \Rightarrow Need $b \geq 0$.

For stability we need $\int_{-\infty}^{\infty} |h(t)| dt < \infty$.

For $b \geq 0 \Rightarrow$ we need $a < 0$.

$$\begin{aligned}
 (b) \quad s(t) &= h(t) * u(t) = \int_{-\infty}^t h(\tau) d\tau = \begin{cases} 0, & t < b \\ \int_b^t 5e^{a\tau-5} d\tau, & t \geq b \end{cases} \\
 &= \frac{5}{a} \left[e^{at-5} - e^{ab-5} \right] u(t-b)
 \end{aligned}$$

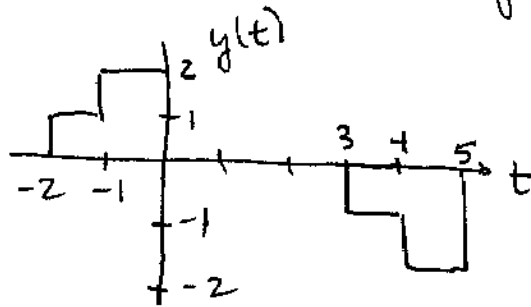
③ (a)



$$(i) y(t) = 0 \text{ for } t-2 < -1 \Rightarrow \underline{t < -1}$$

$$(ii) y_{\max} = y(t) \Big|_{t=\infty} = 2 \int_{-1}^{\infty} h(\tau) d\tau = 1$$

$$(b) x(t) = \delta(t+1) - \delta(t-4) \Rightarrow y(t) = h(t) * x(t) = h(t+1) - h(t-4)$$



$$(4) -t e^{-t^2/2} \longleftrightarrow j\sqrt{2\pi} \omega e^{-\omega^2/2}$$

$$e^{-\frac{(t-2)^2}{2}} \longleftrightarrow \sqrt{2\pi} e^{-2j\omega} e^{-\omega^2/2}$$

$$\cos(2t) e^{-t^2/2} \longleftrightarrow \frac{\sqrt{2\pi}}{2} e^{-\frac{(\omega-2)^2}{2}} + \frac{\sqrt{2\pi}}{2} e^{-\frac{(\omega+2)^2}{2}}$$

$$e^{-2t^2} \longleftrightarrow \frac{\sqrt{2\pi}}{2} e^{-\frac{\omega^2}{8}}$$

$$e^{-\frac{t^2}{2}} * e^{-\frac{t^2}{2}} \longleftrightarrow 2\pi e^{-\omega^2}$$