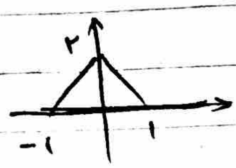
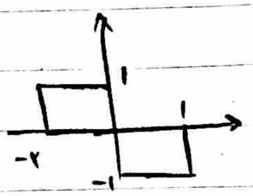
Subject:
Year Month Date:
NOTE BOOK

سوال ۱)

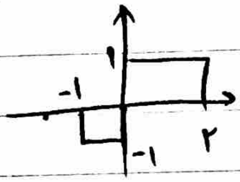
$x(t)$



$h(t) =$

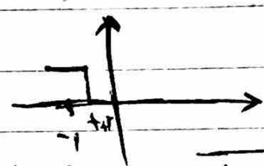


$h(-\tau)$



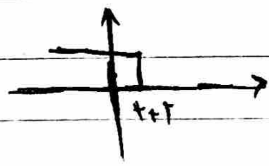
حل $\to$ $t \le -3 \to y(t)=0$

$-3<t<-2 \to h(t-\tau)$



$y(t) = \int_{-1}^{t+2} 2x+2 = x^2+2x\Big|_{-1}^{t+2} = \boxed{t^2+6t+9}$ $Max\{y\} = \boxed{2}$

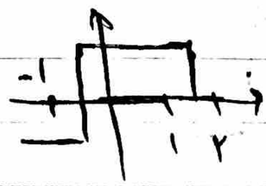
$-2<t<-1 \to h(t-\tau)$



$y(t) = \int_{-1}^{0} 2x+2 + \int_{0}^{t+2} -2x+2 = x^2+2x\Big|_{-1}^{0} + -x^2+2x\Big|_{0}^{t+2} = -t^2-2t-7$

$Max\{y\} = -6$

$-1<t<0 \to h(t-\tau)$



$y(t) = \int_{-1}^{-1+t} -(2x+2) + \int_{-1+t}^{0} 2x+2 + \int_{0}^{2+t} -2x+2$ $\cancel{\boxed{t=-1 \to y(-1)=-8}}$

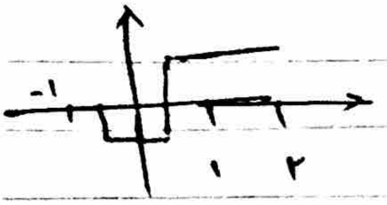
$= -x^2+2x\Big|_{-1}^{-1+t} + x^2+2x\Big|_{-1+t}^{0} + -x^2+2x\Big|_{0}^{2+t}$

Arang $= (t-1)^2 - \cancel{2(t-1)} - (t-1)^2 + \cancel{2(t-1)} - 1 + (t+2)^2 + 2(t+2)$

$-2t^2 + \cancel{4t} - 2 - 1 - t^2 - \cancel{4t} - \cancel{4} + 2t + \cancel{4} = -3t^2+2t-3$

$Max = -3$

$0<t<1$



$$y(t)=\int_{-1+t}^{0} -(2x+2)+\int_{0}^{t} +2x-2+\int_{t}^{1} -2x+2$$

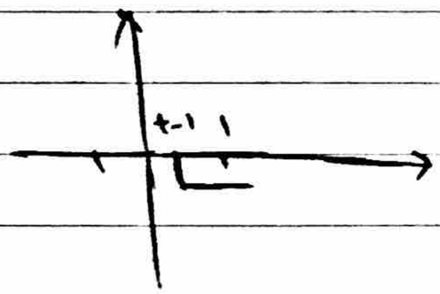
$$=-x^2-2x\Big|_{t-1}^{0}+x^2-2x\Big|_{0}^{t}+-x^2+2x\Big|_{t}^{1}$$

$$=(t-1)^2+2(t-1)+t^2-2t+t^2-2t+1$$

$$=t^2-2t+1-2t-2+t^2-2t+t^2-2t+1$$

$$=3t^2-8t \qquad \boxed{Max(y)=0} \rightarrow \boxed{t=0}$$

$1<t<2$



$$y(t)=\int_{t-1}^{1} 2x-2=x^2-2x\Big|_{t-1}^{1}$$

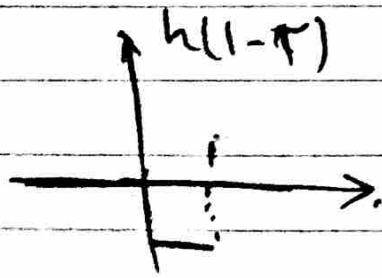
$$=-1-(t-1)^2+2(t-1)$$

$$=-1-t^2+2t-1+2t-2=-t^2+4t-4$$

$$Max(y)=0 \rightarrow \boxed{t=2}$$

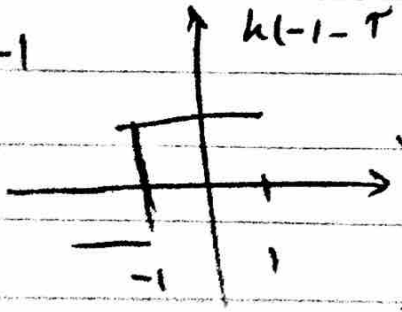
$$t>2 \rightarrow \boxed{y(t)=0}$$

$t=1$



$$\boxed{y(-1)=\int_{0}^{1} +2x-2=x^2-2x\Big|_{0}^{1}=-1}$$

$t=-1$



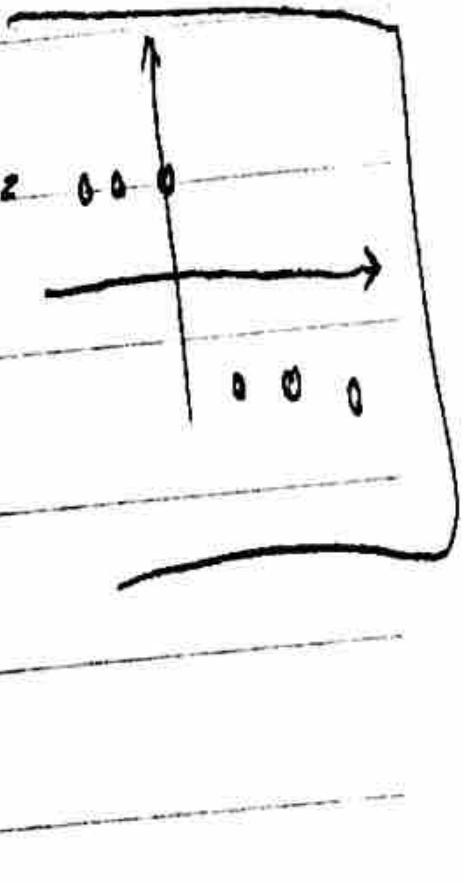
$$y(1)=\int_{-1}^{0} 2x+2+\int_{0}^{1} -2x+2$$

$$\boxed{=\underbrace{x^2+2x\Big|_{-1}^{0}}_{1}+\underbrace{-x^2+2x\Big|_{0}^{1}}_{1}=2}$$

(ب ①)

$x[n] = u[n] \rightarrow y[n]$ ✓

if: $x_1[n] = \delta[n] = u[n] - u[n-1] = x[n] - x[n-1]$

$\Rightarrow y_1[n] = y[n] - y[n-1] \Rightarrow y_1[n] =$ 

$x(t) = 1 + \cos(2\pi t) + \sin(10\pi t + \pi/4)$ (سوال ۲

$T = 1 \qquad T = \frac{1}{5} \longrightarrow \boxed{T = 1} \quad \boxed{\omega_0 = 2\pi}$

$$e^{j0} + \frac{1}{2} e^{j\omega_0 t} + \frac{1}{2} e^{-j\omega_0 t} + \frac{1}{2j} e^{10\pi j t + \pi/4 j} - \frac{1}{2j} e^{-10\pi j t - \pi/4 j}$$

$\rightarrow a_0 = 1 \qquad a_5 = \frac{e^{\pi/4 j}}{2j}$

$a_1 = \frac{1}{2} \qquad a_{-5} = -\frac{e^{-\pi/4 j}}{2j}$

$a_{-1} = \frac{1}{2}$

$$x[n] = \sum_{k=0}^{N} a_k e^{j\omega_k n} \longrightarrow a_k = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-j\omega_k n}$$ ب)

$$a_k = \frac{1}{4} \sum_{n=-1}^{2} x[n] e^{-jk\frac{2\pi}{4} n} = \frac{1}{4}\left(\frac{1}{2} e^{jk\pi/2} + 1 \times 1 + \frac{1}{2} e^{-jk\pi/2}\right)$$

$$= \frac{1}{4} + \frac{1}{4}\left(\frac{e^{jk2\pi/4} + e^{-jk2\pi/4}}{2}\right) = \boxed{\frac{1}{4} + \frac{1}{4}\cos\left(\frac{2\pi}{4} k\right)}$$

$$a_k = \frac{1}{5} \sum_{-2}^{2} x[n] e^{-j\frac{2\pi k}{5} n} = \frac{1}{5}\left(\frac{1}{2} e^{-j\frac{2\pi k}{5}} + \frac{1}{2} e^{j\frac{2\pi k}{5}} + 1\right)$$ ج)

$$= \boxed{\frac{1}{5} + \frac{1}{5}\cos\left(\frac{2\pi k}{5}\right)}$$

Subject:

Year Month Date

NOTE BOOK

3 (a

$$a_k = \frac{1}{T}\int_{\langle T\rangle} x(t)\, e^{-jk\omega_0 t} \qquad \omega_0 = \pi/3$$

$$a_k = \frac{1}{4}\left(\int_{-2}^{2} e^{-jk(\pi/2\, t)}\, dt + \int_{1}^{2} -e^{-jk\,\pi/2\, t}\right)$$

$$= \frac{1}{4}\left(\left(\frac{-1}{jk\pi/3}\left(e^{-jk\pi/2\, t}\Big|_{-2}^{1}\right) + \frac{1}{jk\pi/2}\left(e^{-jk\pi/2\, t}\Big|_{1}^{2}\right)\right)\right)$$

$$= \frac{1}{4}\left(\frac{-3}{jk\pi}\left(e^{-jk\pi/3} - e^{2jk\pi/2}\right) + \frac{3}{jk\pi}\left(e^{-jk2\pi/2} - e^{-jk\pi/2}\right)\right)$$

$$= \frac{-1}{2jk\pi}\left(e^{-jk\pi/2} - e^{-jk2\pi/2} + e^{-jk\pi/2} - e^{+jk\pi/2}\right)$$

$$= \frac{-1}{k\pi}\left(\sin(2\pi/2\, k) - \sin(\pi/2\, k)\right)$$

Arang