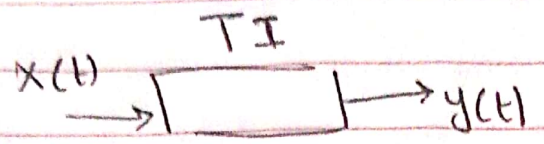
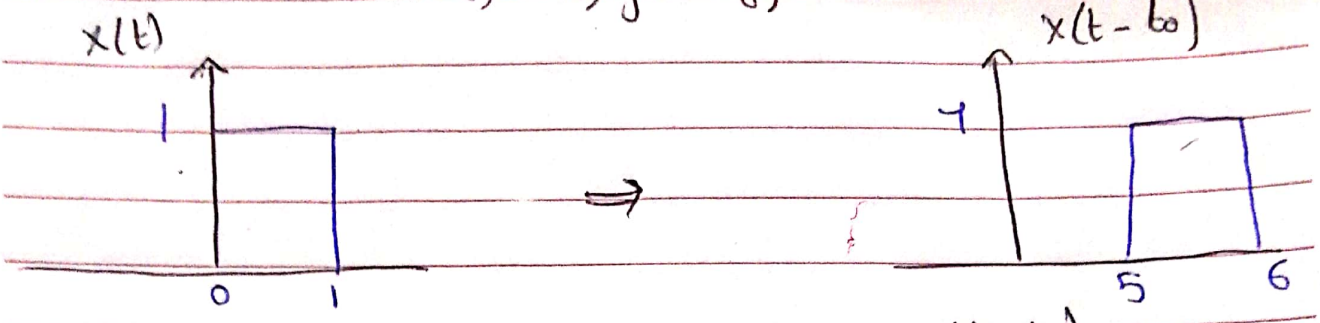
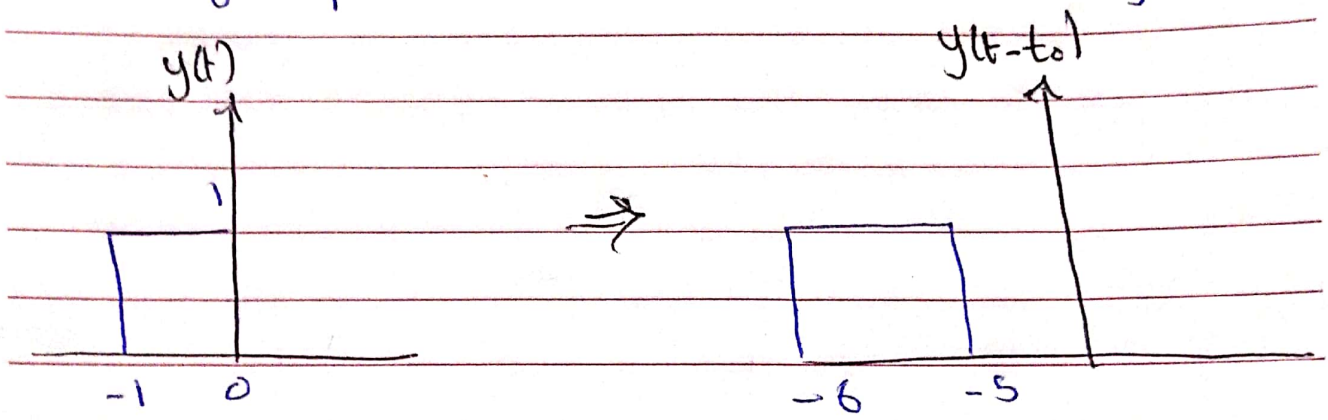
DATE: SUBJECT:

Time invariance

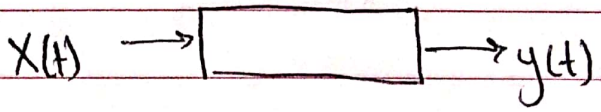


$x(t-t_0) \longrightarrow y(t-t_0)$





linearity



$x(t) \longrightarrow y(t)$

$Ax(t) \longrightarrow Ay(t)$

$x_2(t) \longrightarrow y_2(t)$

$Bx_2(t) \longrightarrow By_2(t)$

$Ax_1(t) + Bx_2(t) \longrightarrow Ay_1(t) + By_2(t)$ superposition

DATE: SUBJECT:

Examples:

$y(t) = t\,x(t)$ linear?

$y(t) \longrightarrow$ "K" $\longrightarrow k\,t\,x(t)$
$x(t) \longrightarrow$ "K" $\longrightarrow t\,k\,x(t)$

also it follows superposition ∴ linear

$y(t) = x^2(t)$

$x(t)$	$y(t)$
$x_1(t)$	$y_1(t) = x_1^2(t)$
$x_2(t)$	$y_2(t) = x_2^2(t)$
$Ax_1(t) + Bx_2$	$A^2x_1^2 + B^2x_2(t) + 2AB\,x_1x_2$

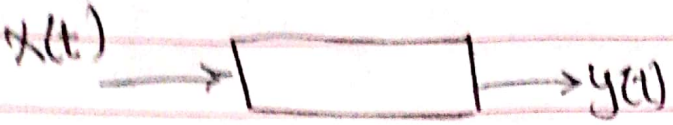
$\neq Ay_1 + By_2$ ∴ Not linear.

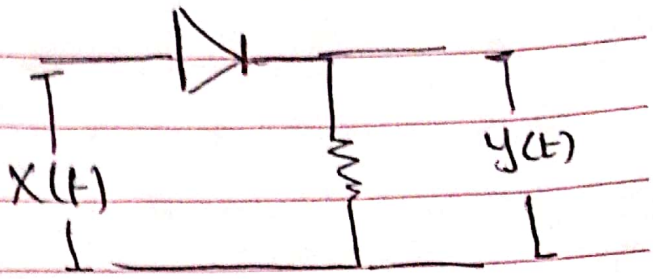
ex2: Determine M, I_n, Caus, Stab., TI, linear

1] $y(t) = 2x(t)$
- Memoryless
- Invertable
- Causal
- Stable
- Time invarient
- linear

2] $y(t) = t\,x(t)$
- Memoryless
- non invartable
- Causal
- unstable
- Time varient
- linear

ATE: SUBJECT:





- Memoryless
- non invertable
- Caused
- stable
- Time invariant

$$y(t) = \begin{cases} X(t) & X(t) \geq 0 \\ 0 & X(t) < 0 \end{cases}$$

Linear time invariant systems

$X_1(t) \longrightarrow y_1(t)$

$X_1(t-t_0) \longrightarrow y_1(t-t_0)$

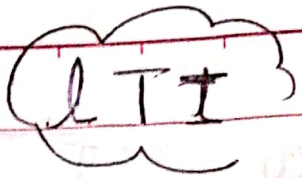
$A X_1(t-t_0) \longrightarrow A y_1(t-t_0)$

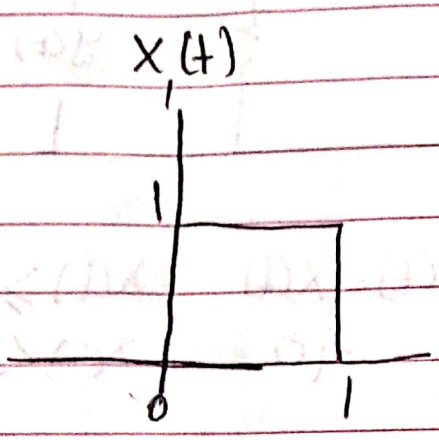
$X_2(t) \longrightarrow y_2(t)$

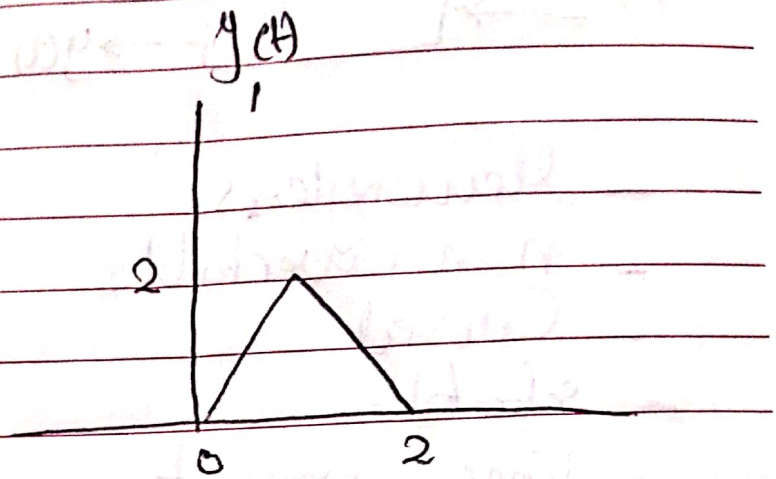
$B X_2(t-t_0) \longrightarrow B y_2(t-t_0)$

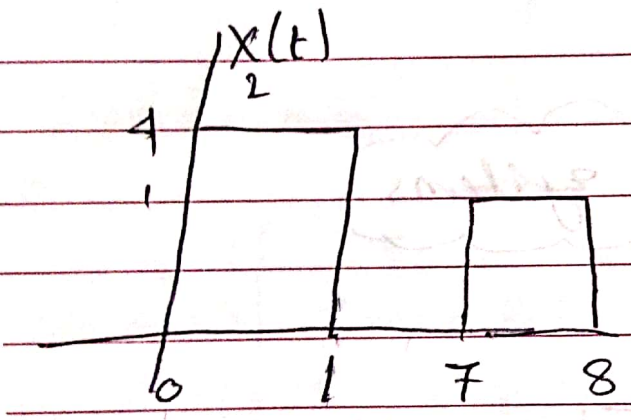
$$A X_1(t-t_0) + B X_2(t-t_0) = A y_1^{(t-t_0)} + B y_2(t-t_0)$$

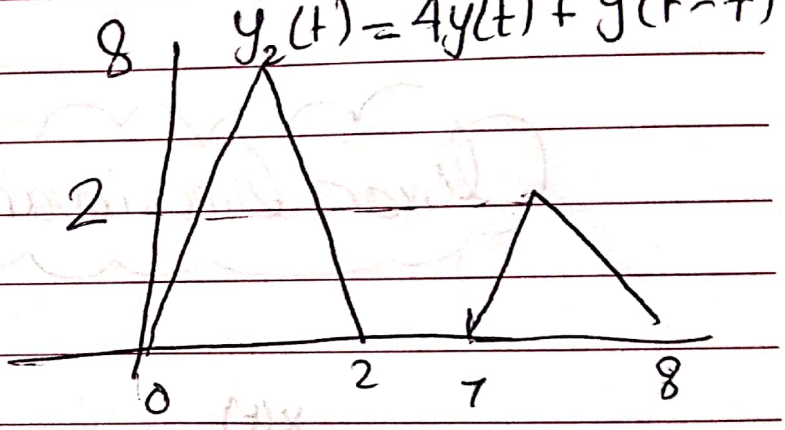
DATE: SUBJECT:











$$X_2(t) = 4X(t) + X(t-7)$$