Lecture Notes 17th October 2016

Time Shift:- Time Shift:- Two signals are identical in shape but that a blufted solative to each other $\chi[n] \Leftrightarrow \chi[n-n_0]$ $\chi[n] \Leftrightarrow \chi[n-2)$ $\chi[n-2]$ $\chi[n] < \chi[n]$ Time Reversal:- $\chi[n] < \chi[n]$ $\chi[n-2]$ $\chi[-(n-2)]$ $\chi[n-2]$ $\chi[-(n-2)]$ $\chi[n-2]$ $\chi[-(n-2)]$ $\chi[-(n-2)]$ $\chi[n] < \chi[-(n-2)]$ $\chi[n] < \chi[-(n-2)]$ $\chi[n] < \chi[-(n-2)]$ $\chi[-(n-2)]$	e displaced or
Dufted relative to each other $x[n] \iff x(n-n_0)$ $x(t) \iff x(t-t_0)$ $x(t) \iff x(t-2)$ x(n-2) $x(n) \qquad x(n-2)$ x[n] < x(n) TIME REVERSAL: x[n] < x(n) x[-(n-2)] x[n-2] < x(t-n-2) x[n-2] < x(n-2) TIME Scaling: x[n] < x(n) is compressed in t	e displaced or
$x[n] \iff x[n-no]$ $x(t) \iff x(t-to)$ $x(t) \implies x(n-2)$ $x(n-2)$ $x(n-2)$ $x[n] \iff x(n)$ $x[n] \iff x(n)$ $x[n] \iff x(n)$ $x[n-2] \implies x[n-2]$ $x[-(n-2)]$ $x[n-2] \implies x[-(n-2)]$	
$\frac{\chi(t) \leftrightarrow \chi(t-t_{0})}{\chi(n-2)}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n-2)}{2}$ $\frac{\chi(n)}{2}$	
Time Scaling:- x(n) $x(n-2)$ $x(n-2)$ $x(n)$ $x(n)$ $x(n)$ $x(n)$ $x(n)$ $x(n)$ $x(n)$ $x(n)$ $x(n-2)$ $x(-(n-2))$ $x(n-2)$ $x(-(n-2))$ $x(n-2)$ $x(-(n-2))$ $x(n-2)$ $x(-(n-2))$ $x(-$	F 4 6
TIME REVERSAL:- x[n] < x[n] x[n] < x[n] x[n] < x[n] x[n-2] < x[n-2] TIME Scaling:- x[n] < x[n] < x	· · · ·
TIME REVERSAL:- x[n] < x[n] x[n] < x[n] x[n] < x[n] x[n-2] < x[n-2] TIME Scaling:- x[n] < x[n] < x	1 x[n-2]
TIME REVERSAL:- $x[n] \xrightarrow{x[n]} \qquad \qquad$	2 9 99
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TIME SHIFT & REVERSAL: x[-(n-2)] $x[n-2]$ x	leiben ein eilen
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x[-(n-2)] x[n-2] $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$	way the self of
x[-(n-2)] x[n-2] $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[n-2]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$ $x[t(n-2)]x[t(n-2)]$ $x[t(n-2)]$	40.
x [n-2] x(-(n-2)) x [n-2] (ENJ JAN
X [n-2] X [n-2] TIME SCALING:- The discrete time sequence x [n] is compressed in t	
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⇒ The discrete time sequence x [n] is compressed in t	CXAMARE #2:
the index n by an integer k. to produce the time	And the second
pourse out of the	Scaled Seallance
r(an).	The segmence
> This extracts every km sample of x[n]. > Entermediate samples are lost.	Dr = GIr Lost

Dav/Date => Also known as Downsampling or decimation. ax (2n) Axlo] x[2n] -4-3-2-10 3 0 4 -2 -1 9 UPSAMPLING OR INTERPOLATION:-=) The discrete time sequence x(n) is expanded in time by dividing the index n by an integer m. to produce the time scaled sequence x[n/m]. > This specifies every min sample. a The intermediate samples must be synthesized (set to zero, or interpolated) a The sequence in longer. nx(n) x[n/2] x[n[2] 20 -2 0 0 -3 0 2 3 1 PERIODICITY :-EXAMPLE #2: j3πt/5 phild. (a) e Sou-If relt) is a peridic signal, then there exists T>O such that x(t)= x(t+T). T=?

Date $W_0 = \frac{2\pi}{T_0}$ ROBLEN # 2: B+ (A+n) x 2) 20 = LAIX the S = T = 21 wo $W_0 = 3TT$ Τ<u>= 2π</u> <u>3π</u> $2\pi \times 5 \Rightarrow 10$ ans 3π b) e'istan/5 N=7 Do = 2T No $\left(\therefore \Omega_0 = 3\pi\right)$ No = 2TK 20 $= \frac{2 \times 5}{3} \xrightarrow{3} \frac{10}{3} \xrightarrow{10} \frac{10}{3}$ $N_{\circ} = 2\pi$ KO DO BI 5 No ->10 ans PROBLEM #1:-Let $x(t) = \cos\left(\frac{\partial x}{\partial T}(t+Tx)+O_{x}\right)$ $w_x = 3T$, $T_x = \frac{1}{2}$, $O_x = TT/y$. (alculate period of x (+)) Sol-T= 2T W $T = 2\pi = 2\pi \times 4 \Rightarrow \frac{8}{3} \text{ s.}$ Fair

Day/Date PROBLEM #2:-Let $x[n] = \omega s \left(\Omega_x \left(n + P_x \right) + \Theta_x \right)$ Determine the period of x(n) when $\Omega x = \frac{3}{4}$, $P_x = 1$, $\Theta_x = \frac{1}{2}/4$ SOL:-SIN = 2TTK K>O some integer $\frac{N}{\kappa} = \frac{2\pi}{\Omega}$ $\frac{2\pi}{3/2} = \frac{2\pi}{3} \times \frac{4}{3} \Rightarrow \frac{8\pi}{3}$ 3/4 N=8TT which is issational hence, it is not periodic. TO=TX TO=2TTV sind $\sin\theta = \sin(\theta + n 2\pi)$ 21 $\chi(t) = \chi(t \pm nT_0)$ -----Fundamental frequency = 70 = 1 Hz To may or may not Fundamental angular freq = Wo = 2TT 70 be an integer. Wo = 211 Yod/sec. tox discrete time signal x[n] = x[n±mN] m= integer N fundamental period (must be an inlege) Fundamental frequency = 1. Hz. x (+) X1 Q: de value is P(T(F) > Foue its periodic. 2 x(+)=24E. x(+)=x(t+nTo) To is undefined incase of de value 70=0 h cycles =0