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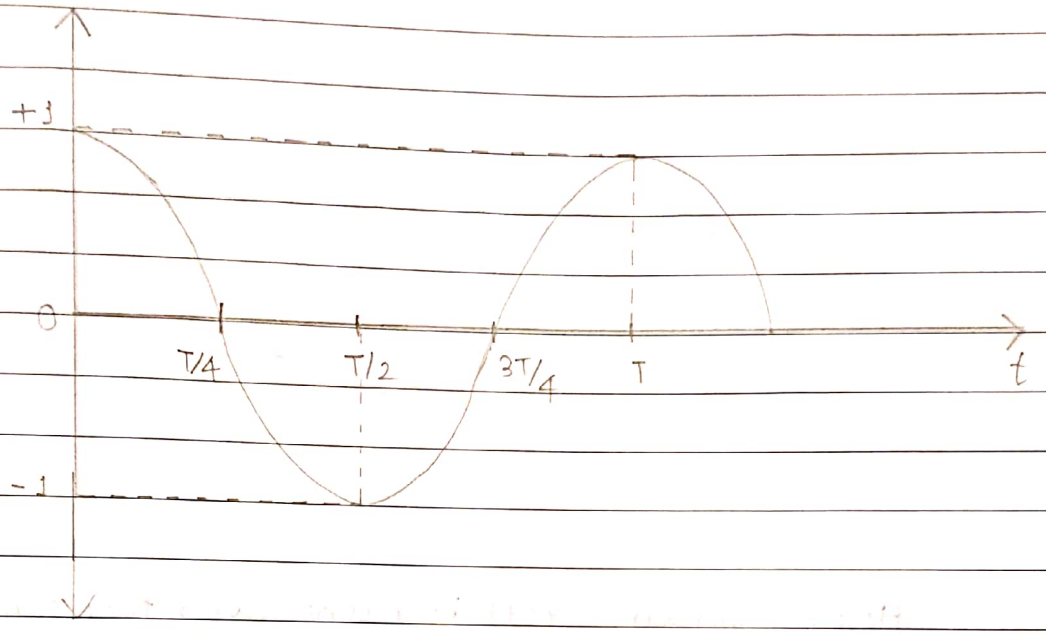
TY BTech EXTC

DSP Assignment - 5

Q1.] Draw $x(t) = \cos(2.pi.t)$; This signal is sampled to get a discrete version $x[n]$.

→ $x(t) = \cos(2\pi t)$



Q2.] Draw the sampled version $x[n] = \cos(2\pi n)$; Compute the frequency. Comment on $x(t)$ & $x[n]$. Discuss the periodicities of $x(t)$ and $x[n]$.

→ Frequency, $(f) = \frac{2\pi}{2\pi} = 1\,Hz$

We know, $f_s \geq 2f$ [from Nyquist Rate]

Let $f_s = 8Hz$

$\therefore N = \frac{f_s}{f} = \frac{8Hz}{1Hz} = \underline{8 \text{ samples}}$

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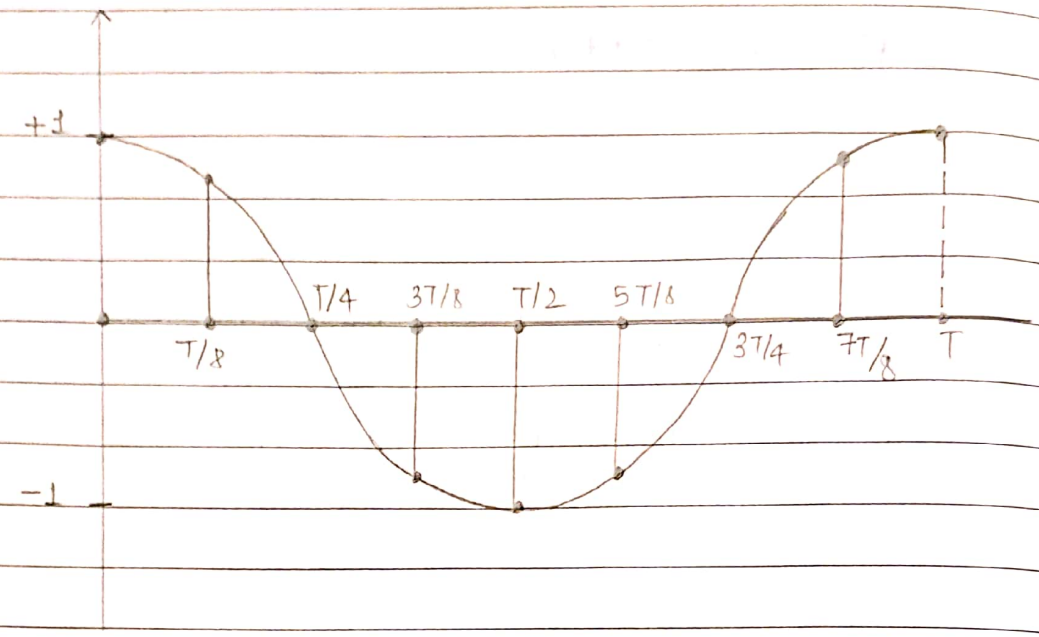
Now, $N = 8$; $x[n] = \cos\left(2\pi \times \frac{1}{8} \times n\right)$



Here, in general, $x(t)$ is a continuous time signal and $x[n]$ is a discrete time signal.

When a signal repeats its values in a fixed time interval or at a fixed frequency, it is said to be periodic.

i.e., when $x(t) = x(t+T)$

at constant frequency ; $x(t)$ is periodic

When $x[n] = \cos(2\pi f_d n)$

where, frequency f_d is irrational number.

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Q3.] Let $y[n] = \cos(2\pi 2\sqrt{3}\, n)$; identify the frequency & comment on periodicity.

→ Here, $y[n] = \cos(2\pi \cdot 2\sqrt{3} \cdot n)$

Comparing it with $y[n] = \cos(2\pi f n)$,

Frequency, $f = 2\sqrt{3}$

As we can see here that f is irrational, so we can say that,

$y[n]$ is not a periodic function.

Although, every Discrete Time signal is frequency periodic at constant time.