

UNIT-1

(Lecture-2)

Periodic & A periodic Signals

Classification of Signals

- Deterministic & Non Deterministic Signals
- **Periodic & A periodic Signals**
- Even & Odd Signals
- Energy & Power Signals

Periodic and Non-periodic Signals

Contd.

- For non-periodic signals

$$x(t) \neq x(t+T_o)$$

- A non-periodic signal is assumed to have a period $T = \infty$
- Example of non periodic signal is an exponential signal

Important Condition of Periodicity for Discrete Time Signals

- A discrete time signal is periodic if

$$x(n) = x(n+N)$$

- For satisfying the above condition the frequency of the discrete time signal should be ratio of two integers

$$\text{i.e. } f_0 = k/N$$

Sum of periodic Signals

- $X(t) = x_1(t) + X_2(t)$
- $X(t+T) = x_1(t+m_1T_1) + X_2(t+m_2T_2)$
- $m_1T_1 = m_2T_2 = T_o =$ **Fundamental period**
- Example: $\cos(tp/3) + \sin(tp/4)$
 - $T_1 = (2p)/(p/3) = 6$; $T_2 = (2p)/(p/4) = 8$;
 - $T_1/T_2 = 6/8 = 3/4 =$ (rational number) = m_2/m_1
 - $m_1T_1 = m_2T_2 \rightarrow$ Find m_1 and $m_2 \rightarrow$
 - $6.4 = 3.8 = 24 = T_o$

Sum of periodic Signals – may not always be periodic!

$$x(t) = x_1(t) + x_2(t) = \cos t + \sin \sqrt{2}t$$

$$T_1 = (2\pi)/(1) = 2\pi; \quad T_2 = (2\pi)/(\sqrt{2});$$

$$T_1/T_2 = \sqrt{2};$$

- Note: $T_1/T_2 = \sqrt{2}$ is an irrational number
- $X(t)$ is aperiodic