UNIT - 1

1) Define unit step, ramp and delta functions for Continuous Time signal.

2) Define power and energy signals.

3) state and prove all five properties of continuous time Impulse function

4) Give the classification for the systems.

5) what is an LTI system.

6) Define the following signals.
(i) exponential function (ii) signum function.

7) what are the basic operations on signals?

8) Define and sketch (a) $\delta(n)$ (b) $u(n)$

9) Define a signal and a system.

10) write short notes on Lumped parameter and distributed systems.

11) Find whether the given $x(t)$ is energy signal or power signal and also find the energy and power of the signal.

$$x(t) = \begin{cases} t-2 ; & -2 \le t \le 0 \\ 2-t ; & 0 \le t \le 2 \\ 0 ; & \text{otherwise} \end{cases}$$

12) State whether the signal $x(t) = 4e^{3t}$ is a power signal or energy signal.

13) Determine the power and rms value of signal

$x(t) = A \sin(\omega_0 t + \theta)$

14) Determine the following signals are energy or power

(a) $x(t) = \mathrm{Rec}\left(\frac{t}{T}\right)$ (b) $x(t) = Ae^{-at}u(t),\ a>0$

(c) $x(t) = t\, u(t)$ (d) $x(t) = \sin(2t)$

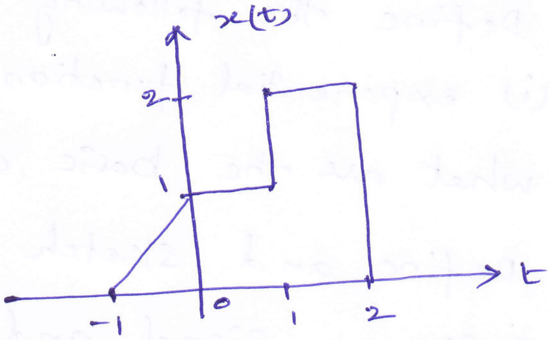
15) Sketch the following signals.

(a) $2u(t+2) - 2u(t-3)$ (b) $r(-t)\, u(t+2)$

16) Given $x(t)$ as shown in figure

plot (i) $x(2t-1)$

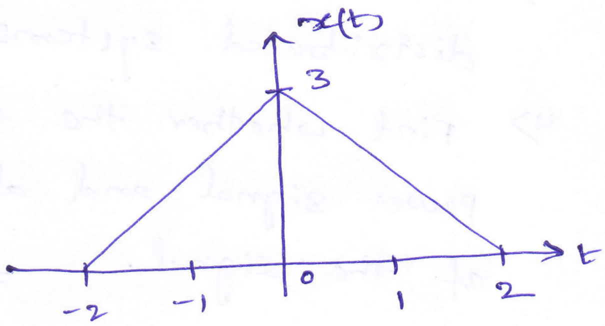
(ii) $x\left(t-\frac{3}{2}\right)$



17) A continuous time signal is shown below in figure

plot (i) $x(2t)$

(ii) $x(3-t)$

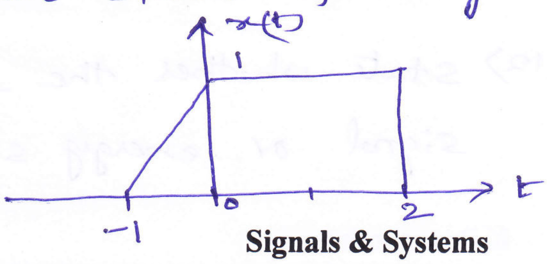


18) For the signal shown in figure sketch the following

(i) $x(t-3)$ (iv) $x(2t-2)$

(ii) $x(t/2)$

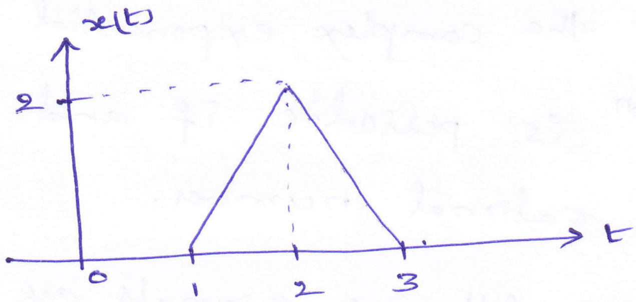
(iii) $x(2-t)$.



19) Sketch the following signals

(a) $u(n+2) \cdot u(-n+3)$ (b) $x(n) = u(n+4) - u(n-2)$

20) Write the mathematical representation for the following signal.



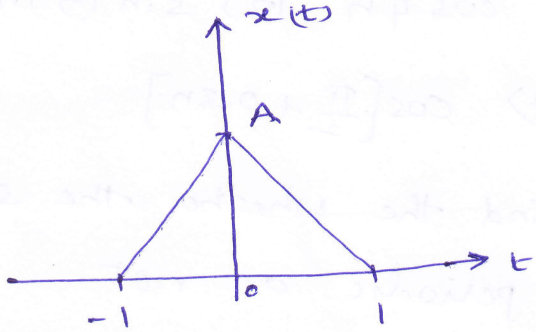
21) For the signal $x(t)$ shown in the figure. Sketch the following.

(i) $x(t+1)$

(ii) $x\left(\frac{t}{2} - 1\right)$

(iii) $x(1-t)$

(iv) $x(2t)$



22) Sketch the following signal $x(t) = u(t+1) - 2u(t) + u(t-1)$

23) Determine whether the following signal is energy signal or power signal $x(t) = 5\cos(\pi t) + \sin(5\pi t)$

24) Find the even and odd components of the signal $x(t) = 5 + 3t + 6t^2 + 7t^3$

25) Find the even and odd components of $u(t)$

26) Find the even and odd components of the signal $\sin(2t) + \cos t$

27) Find the even and odd component of the signal $x(t) = \cos t + \sin t + \sin t \cos t$.

28) check whether the signal $x(t) = e^{j10\pi t}$ is periodic or not, if periodic find the periodicity.

29) show that the complex exponential sequence $x(n) = e^{j\omega_0 n}$ is periodic if and only if $\left(\frac{\omega_0}{2\pi}\right)$ is a rational number.

30) Determine the following signals are periodic or not ?

(1) $\cos 4n$ (2) $\sin(5\pi n)$ (3) $\exp\left(j\frac{\pi}{2}n\right)$

(4) $\cos\left[\frac{\pi}{2} + 0.3n\right]$

31) Find the whether the signal $x(t) = 2\cos(10t+1) - \sin(4t-1)$ is periodic or not.

32) Examine whether the following signals are periodic or not.

(a) $x(t) = 3u(t) + 2\sin 2t$

(b) $x(t) = \sin(10t+1) - 2\cos(5t-2)$

33) Given $x(t) = \cos 2t + \sin 3t$ determine whether the following signal is periodic or not and if it is periodic determine its period.

34) Determine the signal $x(t) = 3\sin 200\pi t + 4\cos 100t$ is periodic or not.

35) (a) check whether the system $y(t) = 2x(t) + x(\frac{t}{2})$ is LTI system or not

(b) check whether the system $y(t) = (t+10)\,u(t)$ is stable or unstable.

36) A Discrete Time system is described by $y(n) = e^{x(n)}$, check the system for linearity, time invariance and stable.

37) Derive the condition for stability for LTI system.

38) check whether the following systems are linear or not and Time-invariant or not.

(i) $y(t) = t \cdot x(t+2)$ (ii) $y(t) = x(t-2) + e^{x(t)}$

39) (a) check the stability of the following system.

(i) $h(n) = 2^n u(n)$ (ii) $y(n) = x(n) + \frac{1}{2}x(n-1) + \frac{1}{4}x(n-2)$

(iii) $y(n) = a\,x(n-7)$ (iv) $h(n) = a^n$ for $0 \le n \le 11$

(b) comment about linearity, causality and time invariance of the system given

$y(n) = 2x(n+1) + x^2(n-1)$

40) check whether the following systems are Linear Time invariant or not.

(a) $y(t) = x\left(\frac{t}{2}\right)$ (b) $y(t) = x(t) + x(t-2)$

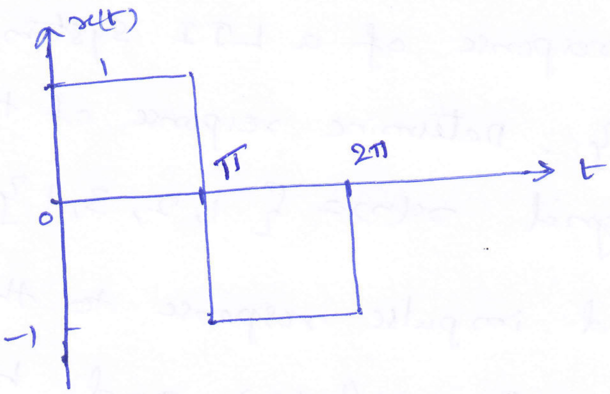
UNIT-2

1) Distinguish between analogy for signals and vectors.

2) Discuss how an unknown function $x(t)$ can be expressed using infinite mutually orthogonal functions.

3) Show that the functions $\sin n\omega_0 t$ and $\cos m\omega_0 t$ are orthogonal over any interval $\{t_0, t_0 + \frac{2\pi}{\omega_0}\}$ for integer values of n and m.

4) Approximate the signal $x(t)$ shown in figure in terms of $\sin t$.



5) Show that the following signals are orthogonal over an interval [0, 1] $x_1(t) = 2$; $x_2(t) = \sqrt{3}(1-2t)$.

6) State and prove Auto correlation function properties of $R_{xx}(\tau)$.

7) Obtain relationship between convolution and correlation.

8) (a) A signal $x(t)$ is given by $\sin\omega_0 t$ find its $R(\tau)$

(b) Find the Auto correlation of the signal $x(t) = A\sin(\omega_0 t + \theta)$

9) Find the convolution of two signals $x_1(t) = e^{-2t}u(t)$, $x_2(t) = e^{-3t}u(t)$ using graphical method.

10) Find the lined convolution of $x(n) = \{2, 4, 3, -6\}$ with $h(n) = \{3, 7, -1, 3\}$

11) Find the lined convolution of $x(n) = \{1, 2, 3, \underset{\uparrow}{-6}\}$ with $h(n) = \{2, 1, -1, 3, \underset{\uparrow}{5}\}$

12) The impulse response of a LTI system is $h(n) = \{1, 2, 1, -1\}$. Determine response of the system to the input signal $x(n) = \{1, 2, 3, 1\}$.

13) The input and impulse response to the systems are given by $x(t) = u(t+2)$ and $h(t) = u(t-3)$. Determine output of the system graphically.

14) Define convolution of two discrete time signals $x(n)$ and $y(n)$.

15) Define exponential Fourier Series.

16) Briefly explain Dirichlet's conditions.

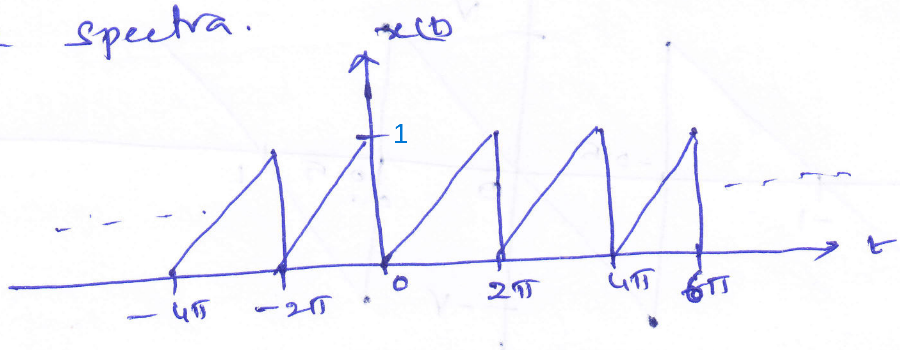
17) Find the convolution of $x_1(t) = u(t+1)$ and $x_2(t) = u(t-2)$ where $u(t)$ is a unit step function.

18) Find the convolution of $x(n) * \delta(n-2)$ given $x(n) = \delta(n+2) + 2\delta(n) + 3\delta(n-2)$

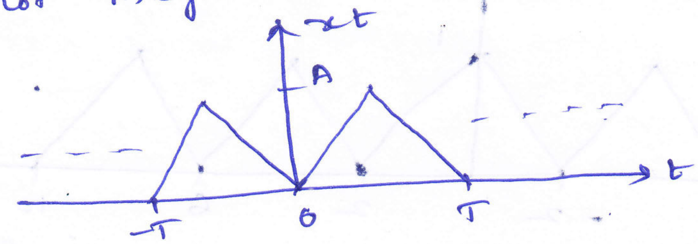
19) How do you obtain exponential Fourier series coefficients from trigonometric Fourier series coefficients.

20) Explain the effect of symmetry on coefficients of fourier series.

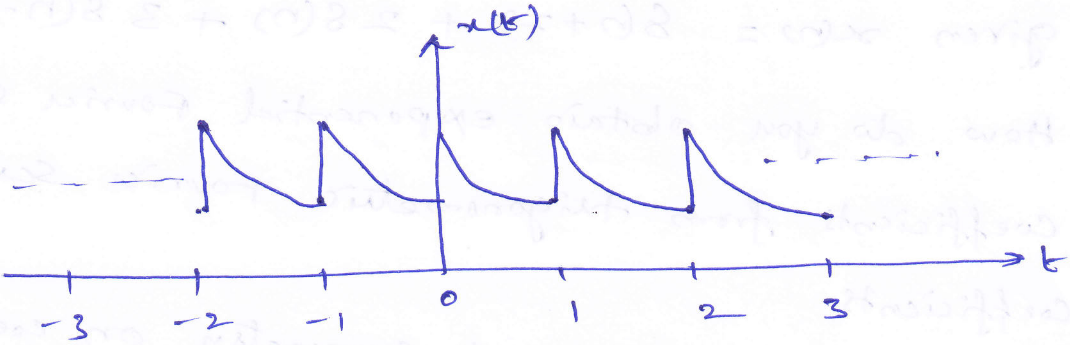
21) obtain the exponential Fourier series for the below waveform $x(t)$ and plot magnitude and phase spectra.



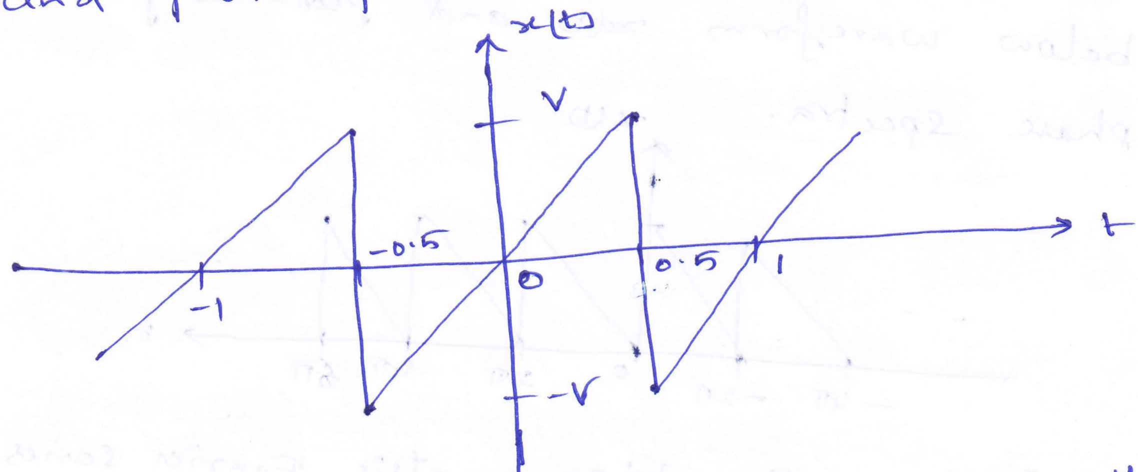
22) Determine the trigonometric Fourier series for the function shown below for the interval $(0, T)$ and plot magnitude and phase spectra.



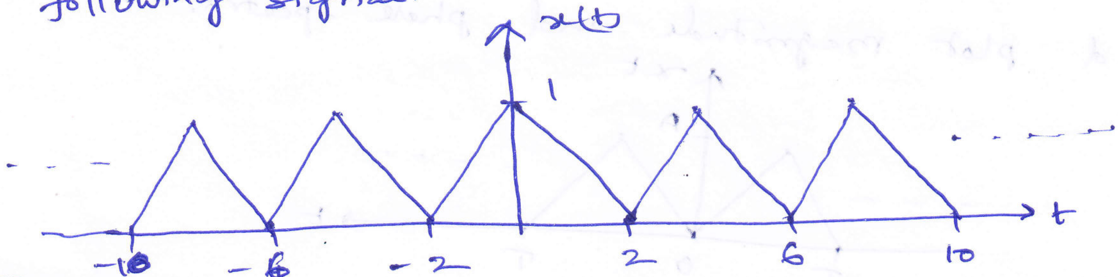
23) Find the Fourier series for the signal $x(t) = e^{-t}$ with $T = 1sec$ as shown in figure below, also obtain magnitude and phase spectrum and draw it.



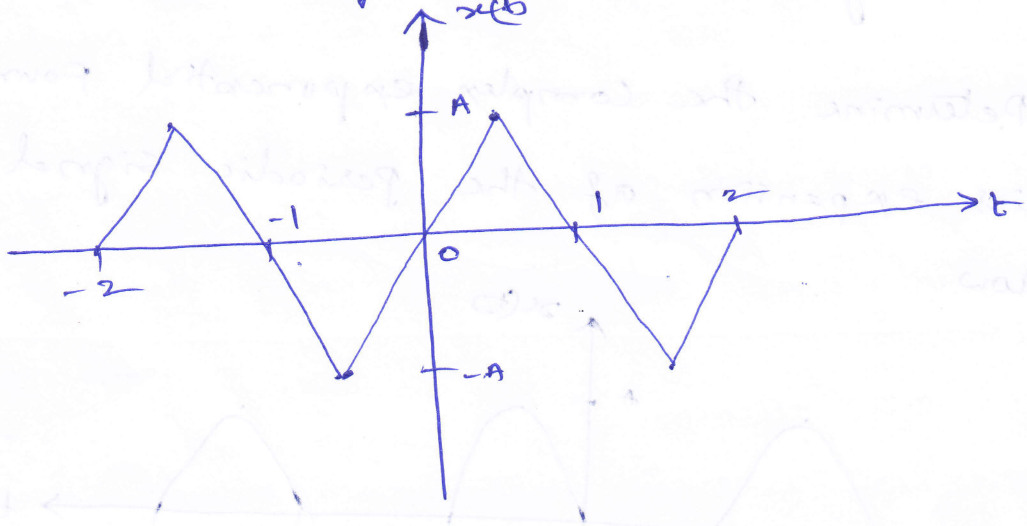
24) Find the trigonometric Fourier series of the following wave form. sketch the magnitude and phase spectra.



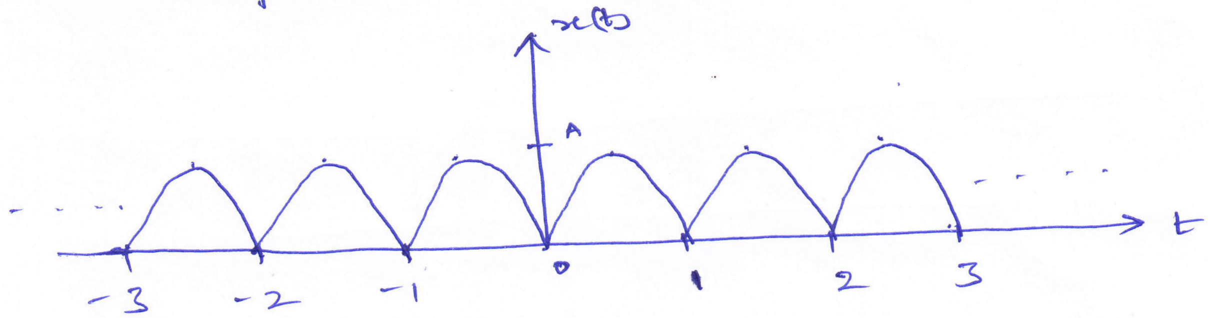
25) Find the trigonometric Fourier series for the following signal.



26) Find the cosine and Trigonometric Fourier series for the signal $x(t)$ shown in figure and sketch magnitude, phase spectra.



27) Find the exponential Fourier series of periodic signal shown below and plot magnitude and phase spectra.



28) Given $x(t) = \sin\left(2t + \frac{\pi}{4}\right)$ and $x(t) = \cos^2 t$. Find complex exponential Fourier series.

29) Find the fourier series for the periodic waveform

$$x(t) = \begin{cases} A \sin \omega t & ; \; 0 \leq t \leq \pi \\ 0 & ; \; \text{otherwise.} \end{cases}$$

30) Find the Fourier series for periodic signal $x(t) = t$ for $0 \le t \le 1$; so that t repeats for every 1 second.

31) Determine the complex exponential Fourier series expansion of the periodic signal shown below.