معادلات اشارات ونظم

An Que:- $\int_0^\infty 2 \cdot e^{at} \cdot e^{bt} \, dt$

Answer:- $\int_0^\infty 2 \cdot e^{(a+b)t} \, dt$

$$\Rightarrow 2 \cdot \left[\frac{e^{(a+b)t}}{(a+b)} \right]_0^\infty$$

$$\Rightarrow \frac{2}{(a+b)} \left[e^{(a+b)(\infty)} - e^{(a+b)(0)} \right]$$

$$\Rightarrow \frac{2}{(a+b)} \left[e^{\infty} - e^{0} \right] \qquad \left\{ \begin{array}{l} e^{\infty} = \infty \\ e^{0} = 1 \end{array} \right\}$$

$$\Rightarrow \frac{2}{(a+b)} \left[\infty - 1 \right]$$

$$\Rightarrow \frac{2}{(a+b)} \left[\infty \right] = \infty$$ Ans.

Integration :- Some more practice :-

Ques 1:- $\int_{-\infty}^{\infty} 2 \cdot e^{at} \cdot e^{bt}\, dt$

Answer:-

$$\int_{-\infty}^{\infty} 2 \cdot e^{at} \cdot e^{bt}\, dt$$

$$\Rightarrow \int_{-\infty}^{\infty} 2 \cdot e^{(a+b)t}\, dt$$

$$\Rightarrow 2 \cdot \int_{-\infty}^{\infty} e^{(a+b)t}\, dt$$

$$\Rightarrow 2 \cdot \left[\frac{e^{(a+b)t}}{(a+b)} \right]_{-\infty}^{\infty}$$

$$\Rightarrow \frac{2}{(a+b)} \left[e^{(a+b)(\infty)} - e^{(a+b)(-\infty)} \right]$$

$$\Rightarrow \frac{2}{(a+b)} \left[e^{\infty} - e^{-\infty} \right] \qquad \left\{ \begin{array}{l} e^{\infty} = \infty \\ e^{-\infty} = 0 \end{array} \right\}$$

$$\Rightarrow \frac{2}{(a+b)} \left[\infty - 0 \right]$$

$$\Rightarrow \frac{2}{(a+b)} \left[\infty \right] = \infty \quad \underline{\text{Answer}}$$

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Example.

Solve the following

(i) $\int_2^0 x^2 + 1 \, dx$

(ii) $\int_0^2 10x^2 + 10 \, dx$

(iii) $\int_0^2 (t^2 + 1) \, dt$

Ans:- (i) $\int_2^0 x^2 + 1 \, dx$

$\Rightarrow \left[\frac{x^3}{3} \right]_2^0 + \left[x \right]_2^0$

$\Rightarrow \frac{1}{3}[0 - 2^3] + [0 - 2] \Rightarrow -\frac{8}{3} - 2 \Rightarrow -\frac{14}{3}$ Ans.

(ii) $\int_0^2 (10x^2 + 10) \, dx$

$\Rightarrow 10 \left[\frac{x^3}{3} \right]_0^2 + 10 \left[x \right]_0^2 \Rightarrow \frac{10}{3}[8 - 0] + 10[2 - 0]$

$\Rightarrow \frac{80}{3} + 20 \Rightarrow \frac{140}{3}$ Ans.

(iii) $\int_0^2 (t^2 + 1) \, dt$

$\Rightarrow \left[\frac{t^3}{3} \right]_0^2 + \left[t \right]_0^2$

$\Rightarrow \frac{1}{3}[8 - 0] + [2 - 0]$

$\Rightarrow \frac{8}{3} + 2 \Rightarrow \frac{14}{3}$ Ans.

[(P-4)/6]

{ Integration is important for chapter 1;

Example → 1

(i) $\int 2x^2\,dx$ (ii) $\int 2\sin\theta\,d\theta$

(iii) $\int (6 + x^2 + \sin x)\,dx$ (iv) $\int 2\cos x\,d\theta$

Ans :- (i) $\int 2x^2\,dx \Rightarrow \frac{2}{3}x^3$ Ans.

(ii) $\int 2\sin\theta\,d\theta \Rightarrow -2\cos\theta$ Ans.

(iii) $\int (6 + x^2 + \sin x)\,dx$

$\Rightarrow \int 6\,dx + \int x^2\,dx + \int \sin x\,dx$

$\Rightarrow 6x + \frac{x^3}{3} - \cos x$ Ans.

(iv) $\int 2\cos \underline{x}\,d\theta$

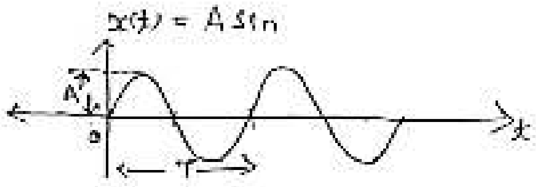
$\Rightarrow 2\cos x \int 1 \cdot d\theta$

$\Rightarrow 2\cos x \cdot \theta$ } – x.

$= 2\frac{\sin x}{x}$

Continuous - Graph

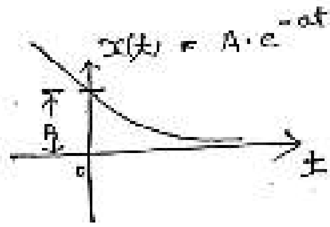
1. $x(t) = A \sin(\omega t + \phi)$



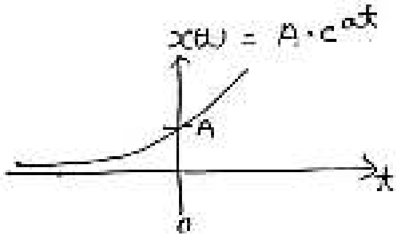
Angular frequency ← $\omega = \frac{2\pi}{T}$ "or" $2\pi f$ → frequency

{ Time period of one cycle }

2. $x(t) = A \cdot e^{-at}$

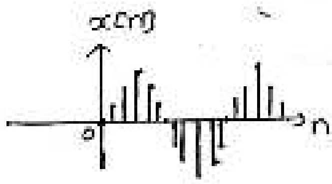


3. $x(t) = A \cdot e^{at}$

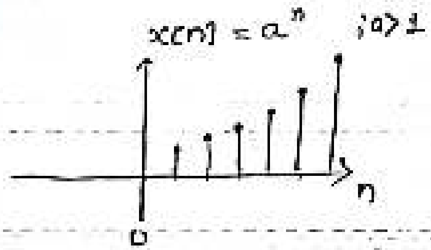


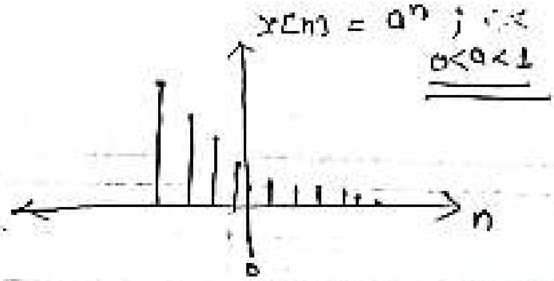
Discrete Graph

1. $x[n] = A \cdot \sin(\omega n + \phi)$



2. $x[n] = a^n$





formulas "Signals & Systems"

$\{ \cdot i^2 = -1$
$\cdot$ i or j, use any one. $\}$

1. $e^{i\theta} = \cos\theta + i\sin\theta$

2. $e^{-i\theta} = \cos\theta - i\sin\theta$

3. $\frac{e^{i\theta} + e^{-i\theta}}{2} = \cos\theta$

4. $\frac{e^{i\theta} - e^{-i\theta}}{2i} = \sin\theta$

Important 5. $e^{a} \times e^{b} = e^{(a+b)}$ ✓

" 6. $\frac{e^a}{e^b} = e^{a-b}$

" 7. $e^0 = 1$; $e^{\infty} = \infty$; $e^{-\infty} = 0$

" 8. $\int 1 \cdot dt = t$

" 9. $\int t \, dt = \frac{t^2}{2}$ or $\int t^n dt = \frac{t^{n+1}}{n+1}$

" 10. $\int e^t dt = e^t$

" 11. $\int e^{at} dt = \frac{e^{at}}{a}$

" 12. $\int \sin(t) dt = -\cos(t)$

" 13. $\int \cos(t) dt = +\sin(t)$

" 14. $\int_a^b t \, dt = \left[\frac{t^2}{2}\right]_a^b \Rightarrow \frac{1}{2}\left[(b)^2 - (a)^2\right]$

[(P-1)/G]

S++Tabassum

Ques 3 :- $\displaystyle\int_{-\infty}^{0} 2 \cdot e^{at} \cdot e^{bt} \, dt$

Ans :- $\displaystyle\int_{-\infty}^{0} 2 \cdot e^{(a+b)t} \, dt$

$$\Rightarrow \quad 2 \cdot \left[\frac{e^{(a+b)t}}{(a+b)} \right]_{-\infty}^{0}$$

$$\Rightarrow \quad \frac{2}{(a+b)} \left[e^{(a+b)(0)} - e^{(a+b)(-\infty)} \right]$$

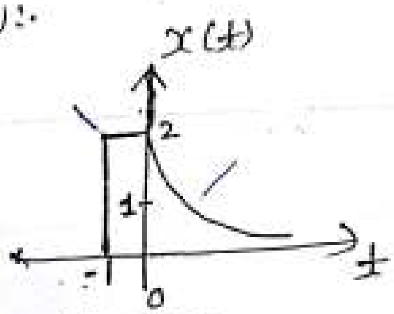
$$\Rightarrow \quad \frac{2}{(a+b)} \left[e^{0} - e^{-\infty} \right] \qquad \left\{ \begin{array}{l} e^{0} = 1 \\ e^{-\infty} = \cancel{\infty}\ 0 \end{array} \right\}$$

$$\Rightarrow \quad \frac{2}{(a+b)} \left[1 - 0 \right]$$

$$= \quad \frac{2}{a+b} \quad \text{Answer}$$

Chapter → 1

Question :- Find the Energy of signal $x(t)$:-



$$\left\{ \text{Energy} = \int_{-\infty}^{\infty} [x(t)]^2 \, dt \right\}$$

Formula

Answer :-

Information ← { Signal $x(t)$ is a combination of two signals. $(-1 \text{ to } 0)$ and $(0 \text{ to } \infty)$.

$$\text{Energy of } x(t) \Rightarrow \int_{-1}^{0} (2)^2 dt + \int_{0}^{\infty} (2 \cdot e^{-t})^2 \, dt$$

↑ first signal. ↑ Second signal.

$$E \Rightarrow \int_{-1}^{0} 4 \cdot dt + \int_{0}^{\infty} (4 \cdot e^{-2t}) \, dt$$

$$E \Rightarrow 4 [t]_{-1}^{0} + 4 \cdot \left[\frac{e^{-2t}}{-2} \right]_{0}^{\infty}$$

$$E \Rightarrow 4 [0 - (-1)] + \frac{4}{(-2)} \left[e^{-2(\infty)} - e^{-2(0)} \right]$$

$$E \Rightarrow 4 [1] + \frac{2}{(-1)} \left[e^{-\infty} - e^{0} \right]$$

$$E = 4 - 2 [0 - 1]$$

$$E \Rightarrow 4 - 2 [-1]$$

$$E = 4 + 2 = 6 \ldots$$

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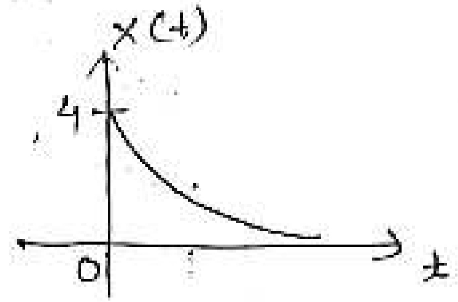
Question:- Find the energy of signal $x(t)$.



Ans:-

$$\text{Energy of } x(t) = \int_{-\infty}^{\infty} [x(t)]^2 \, dt$$

$$\text{Energy of given signal} \Rightarrow \int_{0}^{\infty} (4 \cdot e^{-t})^2 \, dt$$

$$E \Rightarrow \int_{0}^{\infty} (16 \cdot e^{-2t}) \, dt$$

$$E \Rightarrow 16 \int_{0}^{\infty} e^{-2t} \, dt$$

$$E \Rightarrow 16 \cdot \left[\frac{e^{-2t}}{-2} \right]_{0}^{\infty}$$

$$E \Rightarrow \frac{16}{(-2)} \left[e^{-2(\infty)} - e^{-2(0)} \right]$$

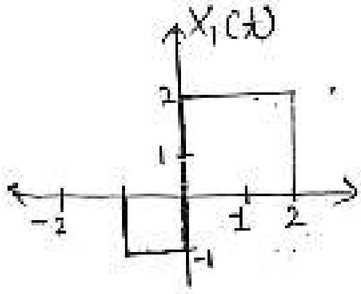
$$E \Rightarrow -8 \left[e^{-\infty} - e^{0} \right]$$

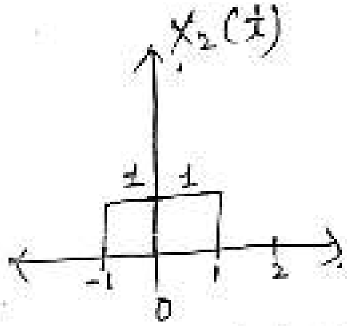
$$E \Rightarrow -8 [0 - 1]$$

$$E \Rightarrow 8 \text{ J}$$ Ans:-

Basic Mathematic Operation

Qus:- Solve the followings :-

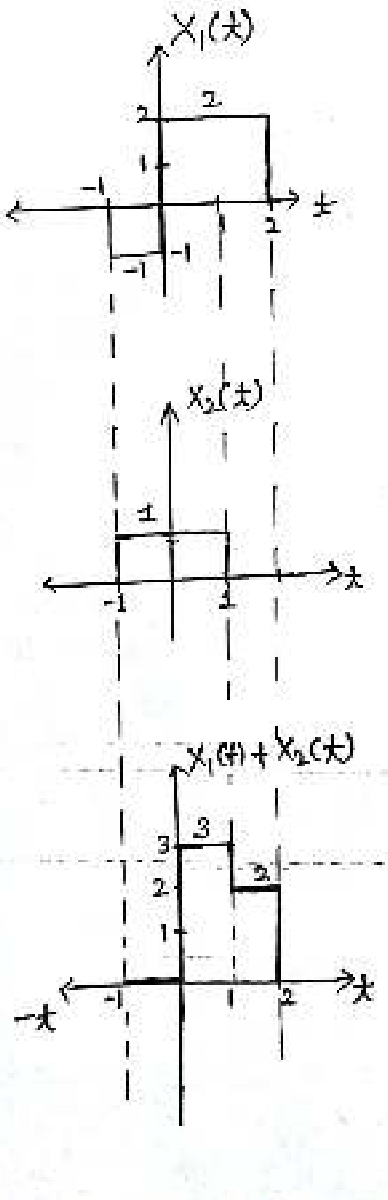




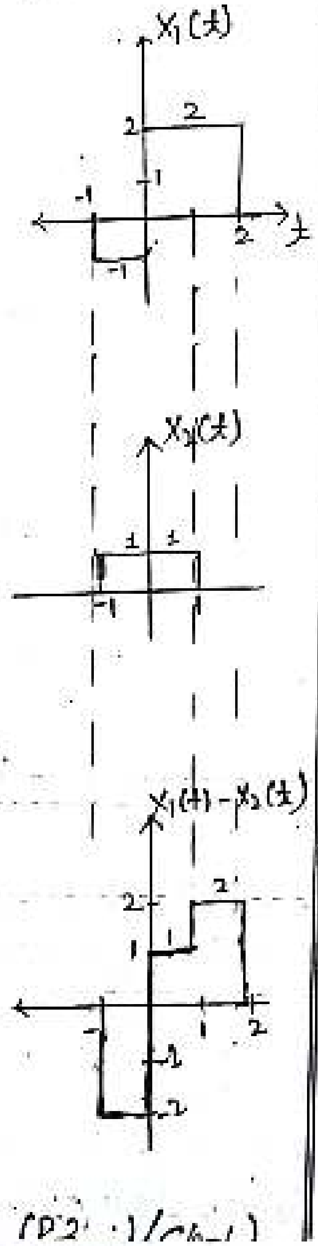
(i) $x_1(t) + x_2(t)$ (ii) $x_1(t) - x_2(t)$ (iii) $x_1(t) \cdot x_2(t)$

Ans:-

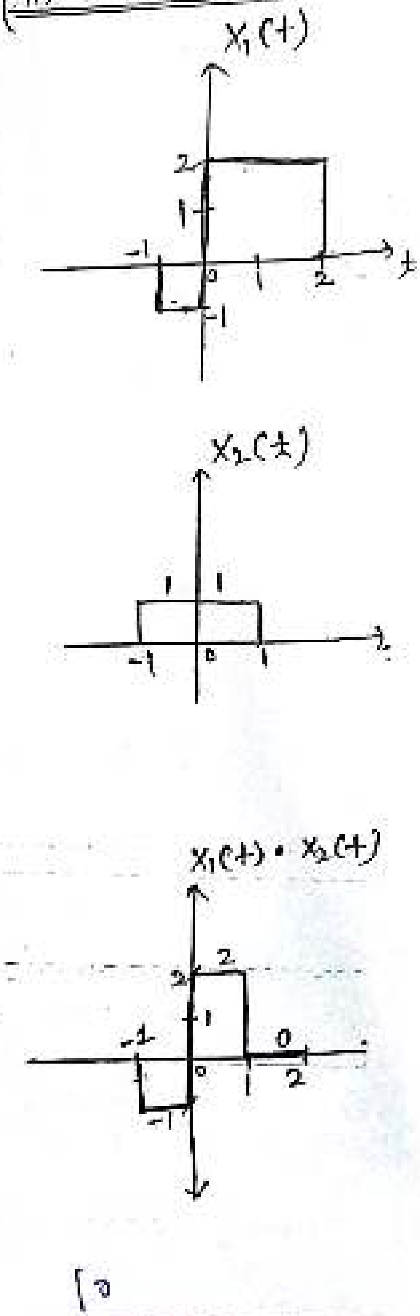
(i) $x_1(t) + x_2(t)$



(ii) $x_1(t) - x_2(t)$

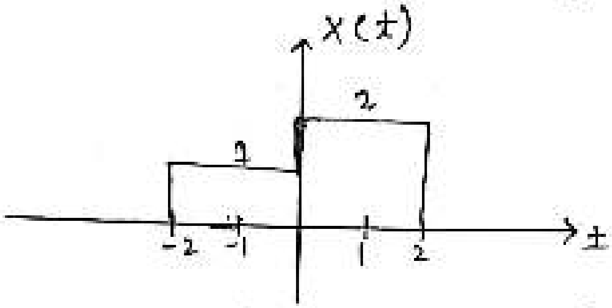


(iii) $x_1(t) \cdot x_2(t)$



Transformations of t

Question:- Solve the followings for the given signal $x(t)$.



(i) $x(t-2)$

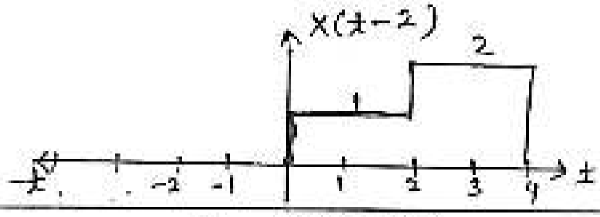
(ii) $x(t+2)$

(iii) $x(2t)$

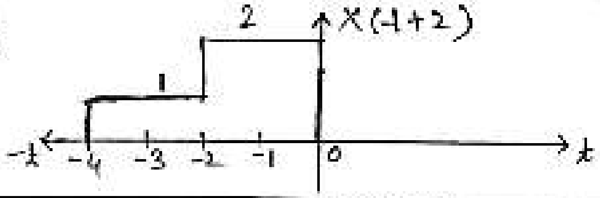
(iv) $x(t/2)$

(v) $x(-t)$

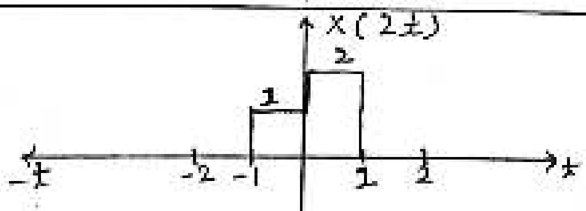
Ans:- (i)



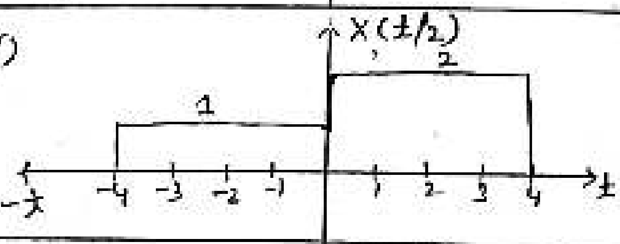
(ii)



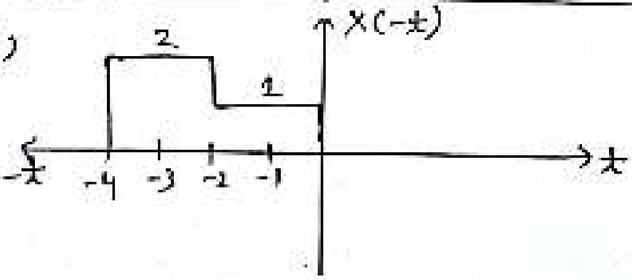
(iii)



(iv)



(v)



Chapter → 2

Question 1:- find the followings are with memory or without memory system:

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

(ii) $y(t) = x(t) + 4x(t)$

(iii) $y(t) = 2x(t-5)$.

Answer:-

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

Step-1 :→ put, $t = 0$

$y(0) = 2x(0)$

Step-2 ⇒ Put, $t = -2$

$y(-2) = 2x(-2)$

output $\{y(t)\}$ depends upon present Input $\{x(t)\}$

So, this is without memory system.

(ii) $y(t) = x(t) + 4x(t)$

Step 1: Put, $t = 0$

$y(0) = x(0) + 4x(0)$

step-2 :→ Put $t = -2$

$y(-2) = x(-2) + 4x(-2)$

output $\{y(t)\}$ depends upon present I/p.

So, without memory system

(iii) $y(t) = 2x(t-5)$

Step-1 Put $t=0$

$y(0) = 2x(0-5)$

$y(0) = 2x(-5)$

output depends upon past input.

So;

System is <u>with memory</u>.

Step 2 $t=-2$

$y(-2) = 2x(-2-5)$

<u>Question</u>- Find the given system is causal or not?

(i) $y(t) = 2x(t) + x(t-2)$

(ii) $y[n] = 4x^2[n] - 2x[n+2]$

<u>Answers</u> (i) $y(t) = 2x(t) + x(t-2)$

<u>Step 1</u>:- Put $t=0$

$y(0) = 2x(0) + x(0-2)$

$\Rightarrow$ output depends upon "<u>present input</u>" and "<u>past Input</u>".
$\quad x(0) \qquad x(-2)$

So, System is <u>causal</u>.

(ii) $y[n] = 4x^2[n] - 2x[n+2]$

<u>Step 1</u>:- Put $t=0$

$y[0] = 4x^2[0] - 2x[0+2]$

$\Rightarrow$ output depends upon "<u>present input</u>" and "<u>past future</u>"
$\quad x^2(0) \qquad x[2]$

So, system is <u>non-causal</u>.

(P-2 / Ch-2)

Linearity Property

Example 1 :- For the given system, $y(t) = x(t^2)$ is given or not?

Answer :-

Step 1 :- Take two individual inputs, and then check the output

$$x(t) \longrightarrow \boxed{S} \longrightarrow y(t) = x(t^2)$$

$$x_1(t) \longrightarrow y_1(t) \Rightarrow x_1(t^2)$$

$$x_2(t) \longrightarrow y_2(t) \Rightarrow x_2(t^2)$$

Add both outputs.

$$\underbrace{y_1(t) + y_2(t)}_{y'(t)} = x_1(t^2) + x_2(t^2) \quad \text{--- (1)}$$

Step 2 :- Two inputs are going to the system at the same time, and then check the output.

$$\{\underbrace{x_1(t) + x_2(t)}_{x''(t)}\} \longrightarrow \boxed{S} \longrightarrow y''(t) = x''(t^2)$$

$$y''(t) = x_1(t^2) + x_2(t^2) \quad \text{--- (2)}$$

Now,

$y'(t) = y''(t)$; means both the output are same. So system is **Linear.**

Example 2:- For the given system, $y(t) = x^2(t)$ is linear or no

Answer:-

Step 1:- Take two individual inputs and then check the output.

$$x_1(t) \longrightarrow y_1(t) = x_1^2(t)$$

$$x_2(t) \longrightarrow y_2(t) = x_2^2(t)$$

Add $y_1(t) + y_2(t)$

$$\underbrace{y_1(t) + y_2(t)}_{y'(t)} = x_1^2(t) + x_2^2(t) \quad \text{---(1)}$$

Step 2:- Two inputs are going to the system at the time and then check the output

$$\underbrace{x_1(t) + x_2(t)}_{x''(t)} \longrightarrow y''(t) = [x''(t)]^2$$

$$y''(t) = [x''(t)]^2$$

$$y''(t) = [x_1(t) + x_2(t)]^2$$

$$y''(t) = x_1^2(t) + x_2^2(t) + 2x_1(t) \cdot x_2(t) \quad \text{---(2)}$$

Now,

Equation (1) $\neq$ Equation (2)

So the given system is not linear.

Example 3:- for the given system, $y(n) = n^2 x[n]$ is linear or not?

Answer:-

Step 1:- Take two individual inputs and then check the output.

- $x_1[n] \rightarrow y_1[n] = n^2 x_1[n]$
- $x_2[n] \rightarrow y_2[n] = n^2 x_2[n]$

Add $y_1[n]$ and $y_2[n]$

$$\underbrace{y_1[n] + y_2[n]}_{y'[n]} = n^2 \cdot x_1[n] + n^2 x_2[n] \quad \text{--- (1)}$$

Step 2:-

$$\underbrace{x_1[n] + x_2[n]}_{x''[n]} \rightarrow y''[n] \rightarrow n^2 x''[n]$$

$$y''[n] = n^2[x_1[n] + x_2[n]]$$

Now,

$$y''[n] = n^2 x_1[n] + n^2 x_2[n] \quad \text{--- (2)}$$

Equation (1) = Equation (2)

Hence,

System is linear.

(P-5 | Ch-2)

Example 4:- For the given system, $y[n] = x^2[n]$ is linear or not?

Ans:- Not linear.

Example 5:- For the given system, $y[n] = 2x[n-5]$ is linear or not?

Ans:- Linear

Example 6:- For the given system, $y(t) = \frac{x(t)}{t}$ is linear or not?

Ans:- Linear

(P-6 / CK-2)

Procedure

Time-Variant Property

Step (1) :- Delay the time by k ; only t with $x(t)$. —(1)

Step (2) :- Delay the time by k ; in all t. —(2)

Step (3) :- If eq(1) = eq(2)
then
System is Time-Invariant.

- **Example**:- for the given system,

$$y[n] = x[n]/n \text{ is Time-Invariant or not?}$$

Answer:- **Step(1)**:- $y[n-k] = x[n-k]/n$ —(1)

Step(2):- $y[n-k] = x[n-k]/(n-k)$ —(2)

Step(3) Eq(1) $\neq$ Eq(2)

System is not Time-invariant.

Example:- for the given system,

$$y[n] = 5x[n-10] \text{ is time-invariant or not?}$$

Answer:- **Step(1)**:- $y[n-k] = 5x[n-k-10]$ —(1)

Step(2):- $y[n-k] = 5x[n-10-k]$. —(2)

Eq(1) = Eq(2)

System is Time-invariant.

Chapter → 3

$h(t)$ = Impulse Response.

$x(t)$ = Input signal.

$y(t)$ = output signal of a continuous-time - LTI system

$$y(t) \Rightarrow \begin{array}{l} h(t) * x(t) = \int_{-\infty}^{\infty} h(\tau) \cdot x(t-\tau)\, d\tau \\ \text{"Or"} \\ x(t) * h(t) = \int_{-\infty}^{\infty} x(\tau) \cdot h(t-\tau)\, d\tau \end{array}$$

Question :- Find the output of a continuous-time LTI system from range "0 to t", if impulse response is $h(t) = e^{-at}$ and input is $x(t) = u(t)$.

Answer :-

$$y(t) = \int_{-\infty}^{\infty} h(\tau) \cdot x(t-\tau)\, d\tau$$

$$y(t) = \int_{0}^{t} e^{-a\tau} \cdot \underbrace{u(t-\tau)}_{1}\, d\tau$$

$$y(t) = \int_{0}^{t} e^{-a\tau}\, d\tau$$

$$y(t) = \left[\frac{e^{-a\tau}}{-a}\right]_{0}^{t}$$

$$y(t) = \frac{1}{-a} \cdot \left[e^{-at} - e^{-a \cdot 0}\right]$$

$$y(t) = \frac{e^{-at} - 1}{-a} \Rightarrow \frac{1 - e^{-at}}{a}$$ Ans....

Question 2:- Consider a LTI - system. Assume the impulse response of the system is $h(t) = 2 \cdot e^{-at}$ and input $x(t) = u(t)$. Find the output for range 0 to t?

Answer:-

$$y(t) = h(t) * x(t)$$

$$y(t) = \int_{-\infty}^{\infty} h(\tau) \cdot x(t-\tau) d\tau$$

$$y(t) = \int_{0}^{t} 2 \cdot e^{-a\tau} \cdot \underbrace{u(t-\tau)}_{1} d\tau$$

$$y(t) = \int_{0}^{t} 2 \cdot e^{-a\tau} d\tau$$

$$y(t) = 2 \cdot \left[\frac{e^{-a\tau}}{-a} \right]_{0}^{t}$$

$$y(t) = \frac{2}{-a} \left[e^{-at} - e^{-a \cdot 0} \right]$$

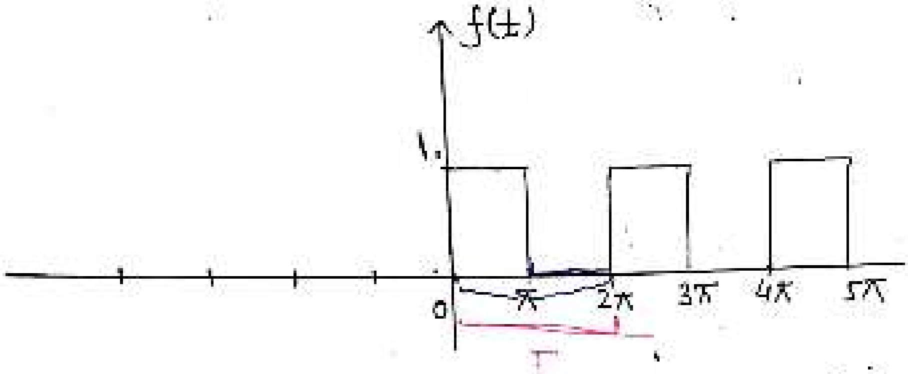
$$y(t) = \frac{2}{-a} \left[e^{-at} - e^{0} \right]$$

$$y(t) = \frac{2}{-a} \left[e^{-at} - 1 \right]$$

$$y(t) = \frac{2 \left[1 - e^{-at} \right]}{a}$$ Ans.

Chapter → 4

Question 1) Find the fourier series of $f(t)$ given below:-



Answer:-

fourier series

$$f(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos(n\omega_0 t) + \sum_{n=1}^{\infty} b_n \sin(n\omega_0 t)$$

or $x(t)$

{cycle upper limit}

signal amplitude

(i) $a_0 = \frac{2}{T} \int f(t)\, dt \Rightarrow \frac{\cancel{2}}{2\pi} \int_0^{2\pi} 1 \cdot dt$

cycle lower limit

Time-period of one cycle.

$$\Rightarrow \frac{1}{\pi} \left[\int_0^{\pi} 1\, dt + \cancel{\int_{\pi}^{2\pi} 0\, dt} \right]$$

T = الدائرة كاملة

$$\Rightarrow \frac{1}{\pi} \int_0^{\pi} 1\, dt$$

f(t) = ارتفاع

$$\Rightarrow \frac{1}{\pi} \left[1t \right]_0^{\pi}$$

$$\Rightarrow \frac{1}{\pi} [\pi - 0] \Rightarrow \frac{\cancel{\pi}}{\cancel{\pi}} \Rightarrow 1$$

$$a_n = \frac{2}{T}\int_0^{2\pi} f(t)\cdot\cos(nt)\,dt$$

$$a_n \Rightarrow \frac{2}{2\pi}\left[\int_0^{\pi} 1\cdot\cos(nt)\,dt + \int_{\pi}^{2\pi} 0\right]$$

$$a_n \Rightarrow \frac{1}{\pi}\left[\frac{\sin(nt)}{n}\right]_0^{\pi}$$

$$a_n \Rightarrow \frac{1}{n\pi}\left[\sin(n\pi) - \underbrace{\sin(n\cdot 0)}_{0}\right]$$

$$a_n \Rightarrow \frac{1}{n\pi}\left[\sin n\pi\right] \#$$

$$b_n = \frac{2}{T}\int_0^{2\pi} f(t)\cdot\sin(nt)\,dt$$

$$b_n \Rightarrow \frac{2}{2\pi}\left[\int_0^{\pi} 1\cdot\sin(nt)\,dt + \int_{\pi}^{2\pi} 0\,dt\right]$$

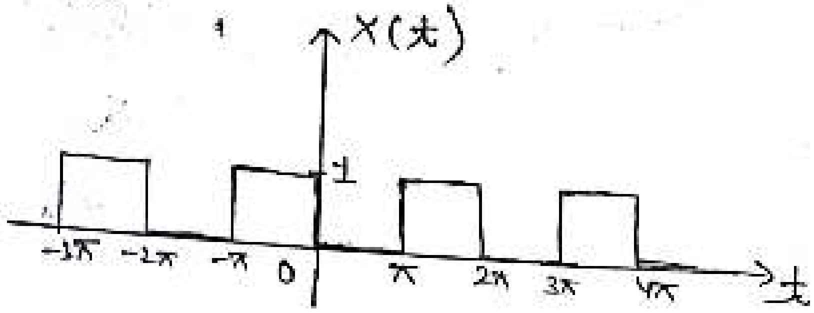
$$b_n = \frac{1}{\pi}\int_0^{\pi} 1\cdot\sin(nt)\,dt$$

$$b_n = \frac{1}{\pi}\left[-\frac{\cos(nt)}{n}\right]_0^{\pi}$$

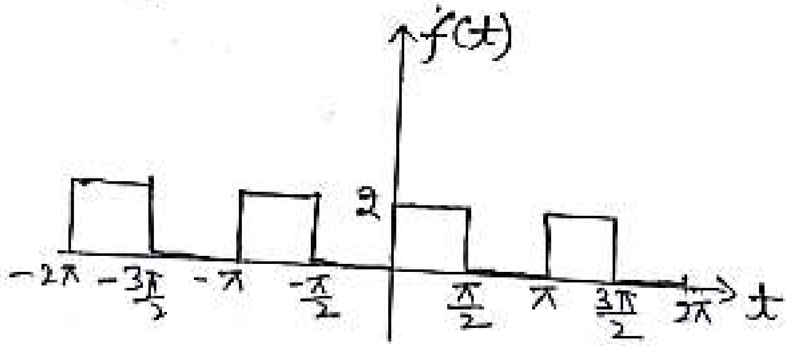
$$b_n = \frac{-1}{n\pi}\left[\cos(n\pi) - \underbrace{\cos(n0)}_{1}\right]$$

$$b_n = \frac{-1}{n\pi}\left[\cos(n\pi) - 1\right]$$

Qustion:2→ find the fourier series of $x(t)$ given below.



Qustion:3→ find the fourier series of $f(t)$ given below.



Chapter→5

Question:1 → find the fourier transform of signal x(t)

$$x(t) = e^{-at}\, u(t)$$

Ans:-

$$X(j\omega) = \int_{-\infty}^{\infty} x(t) \cdot e^{-j\omega t}\, dt$$

$$X(j\omega) = \int_{0}^{\infty} e^{-at} \cdot e^{-j\omega t}\, dt$$

$$X(j\omega) \Rightarrow \int_{0}^{\infty} e^{-t\underbrace{(a+j\omega)}}\, dt$$

$$X(j\omega) \Rightarrow \left[\frac{e^{-t(a+j\omega)}}{-(a+j\omega)} \right]_0^{\infty}$$

$$X(j\omega) \Rightarrow \frac{e^{-\infty(a+j\omega)} - e^{-0(a+j\omega)}}{-(a+j\omega)}$$

$$X(j\omega) \Rightarrow \frac{e^{-\infty} - e^{0}}{-(a+j\omega)}$$

$$X(j\omega) = \frac{0 + 1}{+(a+j\omega)}$$

$$X(j\omega) = \frac{1}{(a+j\omega)}$$

(P-1 / Ch-5)

Question-2 :- Find the fourier transform of $f(t)$ is given as :-

$$f(t) = 2 \cdot e^{-at} \cdot u(t)$$

Answer :-

$$\because f(j\omega) \Rightarrow \int_0^\infty 2 \cdot e^{-at} \cdot e^{-j\omega t} \, dt$$

$$f(j\omega) \Rightarrow 2 \int_0^\infty e^{-t(a+j\omega)} \, dt$$

$$f(j\omega) \Rightarrow 2 \left[\frac{e^{-t(a+j\omega)}}{-(a+j\omega)} \right]_0^\infty$$

$$f(j\omega) \Rightarrow 2 \left[\frac{e^{-\infty(a+j\omega)} - e^{-0(a+j\omega)}}{-(a+j\omega)} \right]$$

$$f(j\omega) \Rightarrow 2 \frac{[e^{-\infty} - e^{0}]}{-(a+j\omega)}$$

$$f(j\omega) \Rightarrow \frac{2\,[0-1]}{-(a+j\omega)}$$

$$f(j\omega) \Rightarrow \frac{\cancel{-}2}{\cancel{-}(a+j\omega)}$$

$$f(j\omega) = \frac{2}{(a+j\omega)}$$ Ans.