MUHAMMAD AHMAD

FA23-BCE-113 Muhammad Ahamd

ASSIGNMENT-01

Q No 1:

(a) $x(t) = \cos\left(t + \frac{\pi}{4}\right)$

$T = \frac{2\pi}{\omega}$

$T = \frac{2\pi}{1}$

hear $\frac{\pi}{4}$ doesn't effect on period

$\boxed{T = 2\pi}$ → periodic Signal

(b) $x(t) = \sin \frac{2\pi}{3} t$

$T = \frac{\cancel{2\pi}}{\cancel{2\pi}/3} = \frac{1}{1/3}$

$\boxed{T = 3}$ → periodic signal

(c) $x(t) = \cos\left(\frac{\pi}{3}t\right) + \sin\left(\frac{\pi}{4}t\right)$

$T_1 = \frac{2\pi}{\omega_1}$ $\quad$ $T_2 = \frac{2\pi}{\omega_2}$

$T_1 = \frac{2\pi}{\pi/3}$ $\quad$ $T_2 = \frac{2\pi}{\pi/4}$

$T_1 = 6$ $\quad$ $T_2 = 8$

Fundamental period $= K = \frac{T_1}{T_2}$

$k = \frac{T_1}{T_2} = \frac{6}{8} \rightarrow T_1(8) = T_2(6)$

$K = 6(8) = 8(6)$

$\boxed{K = 48}$ → periodic signal

(d) $x(t) = \cos(t) + \sin(\sqrt{2}\,t)$

$T_1 = \frac{2\pi}{\omega_1}$ $\quad$ $T_2 = \frac{2\pi}{\omega_2}$

$T_1 = \frac{2\pi}{1}$ $\quad$ $T_2 = \frac{2\pi}{\sqrt{2}}$

$$K = \frac{T_1}{T_2} = \frac{2\pi}{2\pi/\sqrt{2}}$$

$$K = \frac{1}{1/\sqrt{2}} = \sqrt{2}$$

$\boxed{K = \sqrt{2}} \rightarrow$ Aperiodic Signal

(e) $x[n] = \cos\frac{\pi}{3}n + \sin\frac{\pi}{4}n$

$T_1 = \frac{3\pi}{\omega}$ $\qquad$ $T_2 = \frac{2\pi}{\omega}$

$T_1 = \frac{2\pi}{\pi/3}$ $\qquad$ $T_2 = \frac{2\pi}{\pi/4}$

$T_1 = 6$ $\qquad$ $T_2 = 8$

$$K = \frac{T_1}{T_2} = \frac{6}{8} = \frac{3}{4}$$

$K = 4T_1 = 3T_2$

$K = 4(6) = 3(8)$

$\boxed{K = 24} \rightarrow$ periodic signal

M T W T F S

Date: __/__/__

Q NO 2:

$$y(t) = x(t) \cdot \cos\omega_0 t$$

(a) memoryless:

$t = 0$:

$y(0) = x(0) \cdot \cos\omega_0 0$

$t = 1$:

$y(1) = x(1) \cdot \cos\omega_0 \cancel{t}$

$\cancel{t} = -1$

$y(-1) = x(-1) \cdot -\cos\omega_0$

System only depend on present value of input, So the system is memoryless.

(b) causal:

System is causal as it is memoryless so it only define on present value of input.

(c) linear

$y_1(t) = x_1(t) \cos w_o t$

$y_2(t) = x_2(t) \cos w_o t$

LHS:

$y_3'(t) = a_1 y_1(t) + a_2 y_2(t)$

$y_3'(t) = a_1 x_1(t) \cos w_o t + a_2 x_2(t) \cos w_o t$

RHS

$y_3(t) = f[a_1 x_1(t) + a_2 x_2(t)]$

$y_3(t) = \cos w_o t (a_1 x_1(t) + a_2 x_2(t)$

$y_3(t) = a_1 x_1(t) \cos w_o t + a_2 x_2(t) \cos w_o t$

LHS = RHS

So, the system is linear

(d) time-invarient:

$y(t, t_1) = f(x(t - t_1)$

LHS

$y(t, t_1) = x(t - t_1) \cos w_o t$

RHS:

$y(t - t_1) = x(t - t_1) \cos w_o (t - t_1)$

LHS $\neq$ RHS

So system is invarient

(e) stable:

let $\rightarrow |x(t)| = \gamma$

$\rightarrow |\cos w_0 t| \leq 1$

So

$$y(t) = |x(t) \cos w_0 t|$$

$\boxed{y(t) = \gamma} \rightarrow$ stable

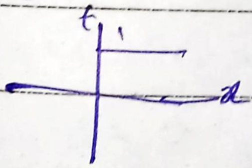
Q NO 3:

(a)

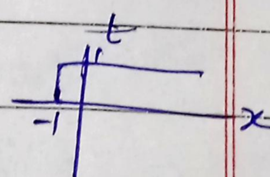
$x(t)\, u(1-t)$

$\rightarrow u(1-t) = u(-t+1)$

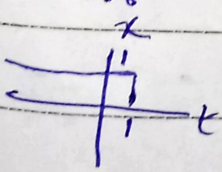
$u(t)$:



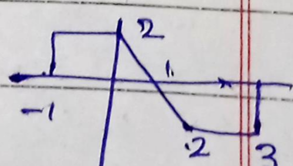
$\xrightarrow{u(t+1)}$



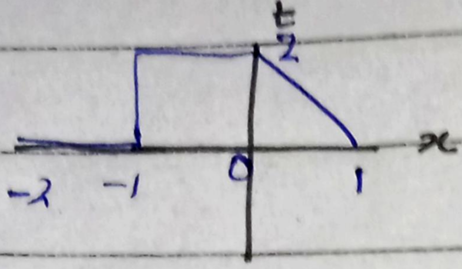
$u(1-t)$:



$x(t) =$

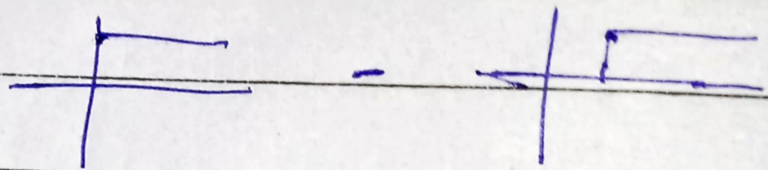


$x(t)\,u(1-t)$:

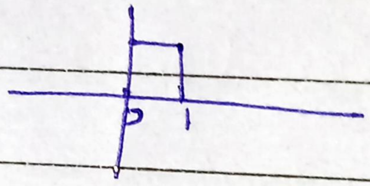


(b) $x(t)\,[u(t)-u(t-1)]$

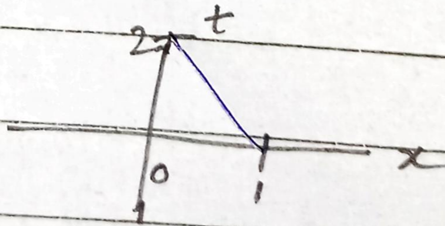
$\rightarrow u(t)-u(t-1)$



=

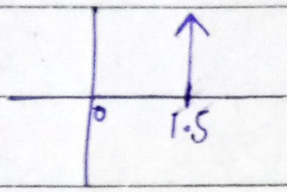


$x(t) \times [u(t)-u(t-1)$

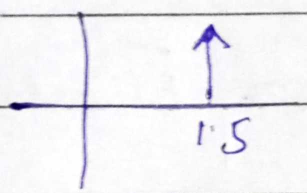


(c) $x(t)\,\delta(t-\frac{3}{2})$

$\delta(t-1.5)$



$x(t) \times \delta(t-\frac{3}{2})$



x