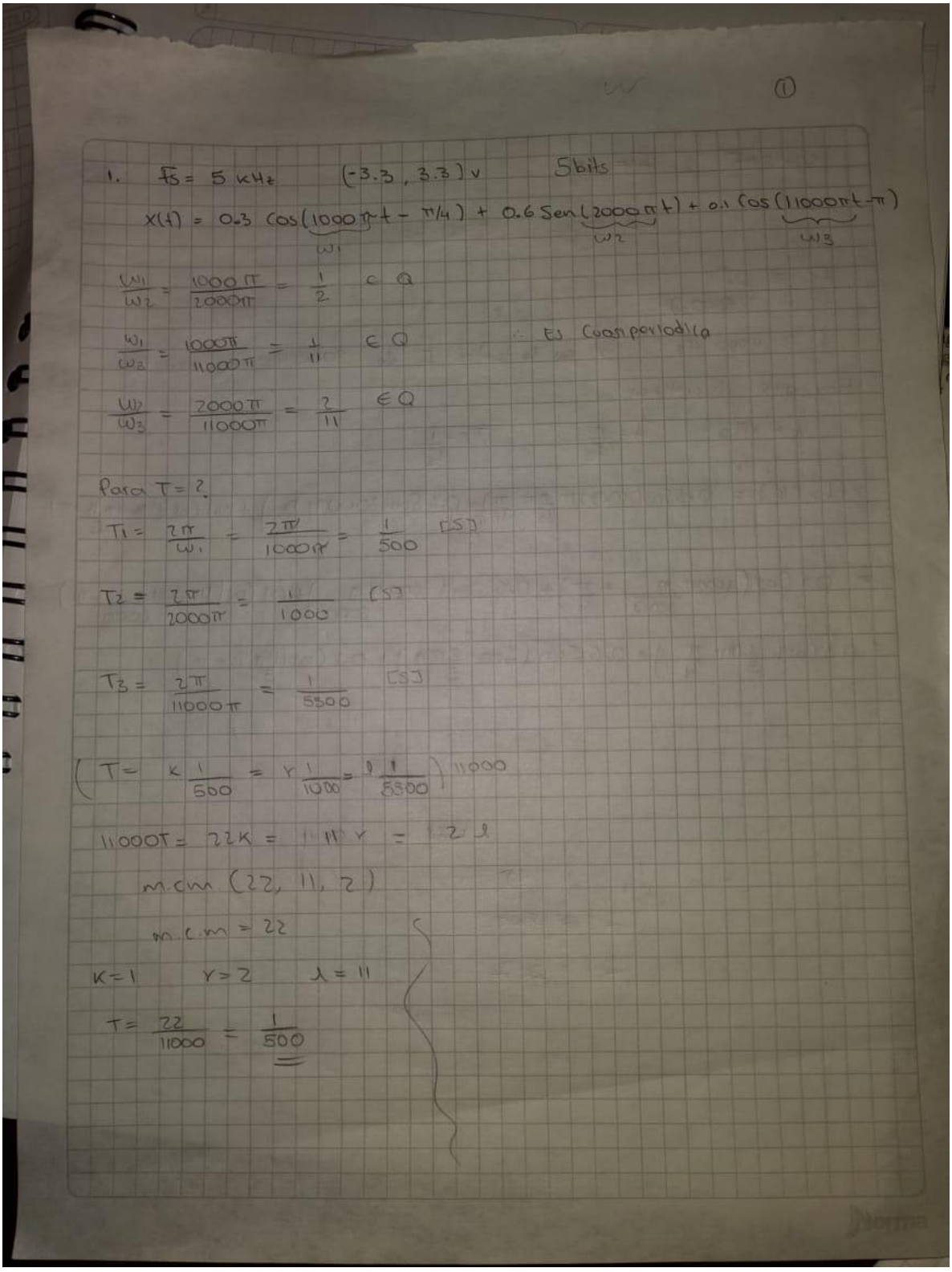
Punto 1:



1. $f_s = 5\ kHz$ $(-3.3, 3.3)\ v$ 5bits

$x(t) = 0.3\cos(\underbrace{1000\pi}_{w_1} t - \pi/4) + 0.6\,Sen(\underbrace{2000\pi}_{w_2} t) + 0.1\cos(\underbrace{11000\pi}_{w_3} t - \pi)$

$\frac{w_1}{w_2} = \frac{1000\pi}{2000\pi} = \frac{1}{2} \in \mathbb{Q}$

$\frac{w_1}{w_3} = \frac{1000\pi}{11000\pi} = \frac{1}{11} \in \mathbb{Q}$ ∴ Es Casiperiodica

$\frac{w_2}{w_3} = \frac{2000\pi}{11000\pi} = \frac{2}{11} \in \mathbb{Q}$

Para T = ?

$T_1 = \frac{2\pi}{w_1} = \frac{2\pi}{1000\pi} = \frac{1}{500}$ [S]

$T_2 = \frac{2\pi}{2000\pi} = \frac{1}{1000}$ [S]

$T_3 = \frac{2\pi}{11000\pi} = \frac{1}{5500}$ [S]

$T = k\frac{1}{500} = \gamma\frac{1}{1000} = \lambda\frac{1}{5500}$ | 11000

$11000T = 22K = 11\gamma = 2\lambda$

m.c.m (22, 11, 2)

m.c.m = 22

K = 1 γ = 2 λ = 11

$T = \frac{22}{11000} = \frac{1}{500}$

$\omega = 2\pi f \qquad f = \frac{\omega}{2\pi}$

T. Nyquist

$f_1 = 500 \qquad f_2 = 1000 \qquad f_3 = 5500$

$f_s \geq 2(500) \qquad f_s \geq 2(1000) \qquad f_s \geq 2(5500)$
$f_s \geq 1000 \qquad f_s \geq 2000 \qquad f_s \geq 11000$

$\therefore$ 5000 Hz no cumple

$t = \frac{n}{f_s}$

$$x(t = n/f_s) = 0.3\cos\left(1000\pi\frac{n}{f_s} + \frac{\pi}{4}\right) + 0.6\,\mathrm{Sen}\left(2000\pi\frac{n}{f_s}\right) + 0.1\cos\left(11000\pi\frac{n}{f_s} - \pi\right)$$

$$= 0.3\cos\left(\frac{\pi n}{5} + \frac{\pi}{4}\right) + 0.6\,\mathrm{Sen}\left(\frac{2\pi n}{5}\right) + 0.1\cos\left(\frac{11}{5}\pi n - \pi\right)$$

$\Omega_1 = \frac{\pi}{5} \qquad \Omega_2 = \frac{2\pi}{5} \qquad \Omega_3 = \frac{11}{5}\pi$

$\frac{11}{5}\pi > \pi$; $\therefore$ $-\pi \leq \Omega_3 \leq \pi$ Ω_3 es otra copia

$\Omega_{orig} = \Omega - 2\pi = \frac{\pi}{5} \qquad -\pi \leq \Omega_{orig} \leq \pi$

$f_{orig} = ?$ $\qquad \Omega_{orig} = 2\pi f_{orig}$
$\Omega_{orig} = 2\pi \frac{f_{orig}}{f_s}$

$\frac{f_s\,\Omega_{orig}}{2\pi} = f_{orig}$; $f_{orig} = \frac{(5000)(\pi/5)}{2\pi}$

$f_{orig} = 500$ Hz

$f_s = 2f_3 = 11000$ Hz → tomando un nuevo switch.

$x[n/f_s] = 0.1\cos\left(\frac{11000}{11000}\pi n - \pi\right)$

$= 0.1\cos(\pi n - \pi) \qquad \Omega_3 = \pi$ → original.

$\pi \Rightarrow \qquad -\pi < n \leq \pi$

Certificados de Kaggle:

kaggle

CERTIFICATE OF COMPLETION

William Camilo Obando

HAS SUCCESSFULLY COMPLETED THE COURSE

Intro to Programming

ON NOVEMBER 30, 2024

ALEXIS COOK, HEAD OF KAGGLE LEARN

kaggle

CERTIFICATE OF COMPLETION

William Camilo Obando

HAS SUCCESSFULLY COMPLETED THE COURSE

Python

ON DECEMBER 5, 2024

COLIN MORRIS, KAGGLE INSTRUCTOR

ALEXIS COOK, HEAD OF KAGGLE LEARN