

Jonathan Sumner

Lab 9 – DFT (FFT/IFFT)

EEET-332.01 – Signals, Systems, and
Transformers Lab

Due Date: 11/17/2024

$c_m (m=2):$

$$c_2 = \frac{1}{8} \sum_{n=0}^7 f(nT_s) e^{-j \frac{2\pi(2)n}{8}}$$

$$= \frac{1}{8} (1 e^{-j \frac{(2)2\pi(0)}{8}} + 1 e^{-j \frac{(2)2\pi(1)}{8}} + 1 e^{-j \frac{(2)2\pi(2)}{8}} + 1 e^{-j \frac{(2)2\pi(3)}{8}})$$

$$= \frac{1}{8} (1 - j - 1 + j)$$

$$= \frac{1}{8} (1 - 1 + j - j)$$

$$= \frac{1}{8} (0)$$

$$\boxed{= 0}$$

$c_m (m=3):$

$$c_3 = \frac{1}{8} \sum_{n=0}^7 f(nT_s) e^{-j \frac{(3)2\pi n}{8}}$$

$$= \frac{1}{8} (1 e^{-j \frac{(3)2\pi(0)}{8}} + 1 e^{-j \frac{(3)2\pi(1)}{8}} + 1 e^{-j \frac{(3)2\pi(2)}{8}} + 1 e^{-j \frac{(3)2\pi(3)}{8}})$$

$$= \frac{1}{8} (1 - 0.7071 - j0.7071 + j + 0.7071 - j0.7071)$$

$$= \frac{1}{8} (1 - j0.442)$$

$$\boxed{= 0.1250 - j0.0518}$$

$C_m(m=4)$:

$$C_4 = \frac{1}{8} \sum_{n=0}^7 f(nT_s) e^{-j \frac{(4)2\pi n}{8}}$$

$$= \frac{1}{8} (1 e^{-j \frac{(4)2\pi(0)}{8}} + 1 e^{-j \frac{(4)2\pi(1)}{8}} + 1 e^{-j \frac{(4)2\pi(2)}{8}} + 1 e^{-j \frac{(4)2\pi(3)}{8}})$$

$$= \frac{1}{8} (1 - 1 + 1 - 1)$$

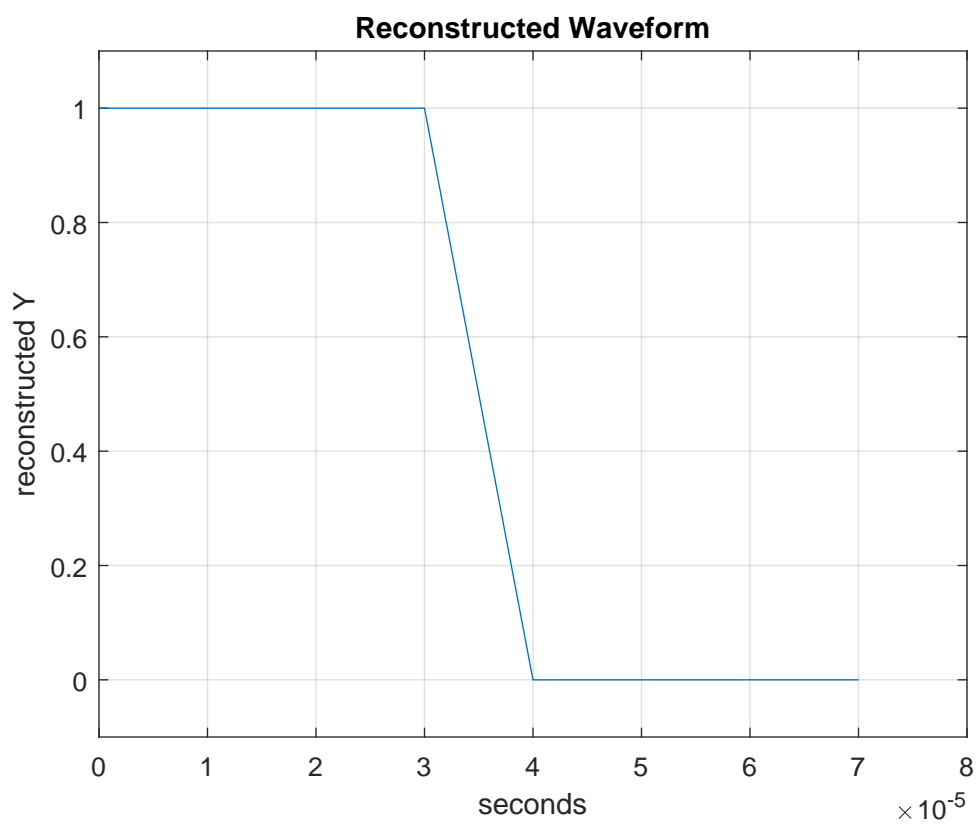
$$= 0$$

Section 3:

$$Y = \sum_{m=0}^{N-1} C_m(m) \cdot e^{j2\pi mn/N}$$

$$= 0.5 + (0.125 - 0.3018j) e^{j2\pi n/8} + 0 + (0.125 - 0.0518j) e^{j6\pi n/8} \\ + 0 + (0.125 + 0.0518j) e^{j10\pi n/8} + 0 + (0.125 + 0.3018j) e^{j14\pi n/8}$$

m	cm by hand	frequency	cm *
0	0.5	DC	0.5
1	$0.125 - 0.3018j$	f_0 (fundamental) = $1/(N \cdot T_s) = 12.5\text{KHz}$	$0.1250 - 0.3018i$
2	0	2nd (fundamental) = $2/(N \cdot T_s) = 25\text{KHz}$	0
3	$0.1250 - 0.0518j$	3rd (fundamental) = $3/(N \cdot T_s) = 37.5\text{KHz}$	$0.1250 - 0.0518i$
4	0	4th (fundamental) = $4/(N \cdot T_s) = 50\text{KHz}$	0
5	$0.125 + 0.05178j$	-3rd (fundamental) = $-3/(N \cdot T_s) = -37.5\text{KHz}$	$0.1250 + 0.0518i$
6	0	-2nd (fundamental) = $-2/(N \cdot T_s) = -25\text{KHz}$	0
7	$0.125 + 0.3018j$	$-f_0$ (fundamental) = $-1/(N \cdot T_s) = -12.5\text{KHz}$	$0.1250 + 0.3018i$



Signals Systems and Transforms

EEET-332

Lab 9

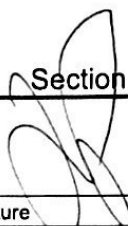
Report:

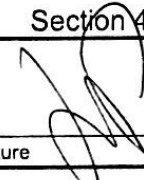
Create your own cover page.

Submit your cover page, the requested prints (sections 2 and 3 only), and this sign-off sheet on the second page.

Sign-offs

Name Jonathan Sumner

Section 1: Plot	
	11/11/2024
Signature	Date

Section 4: Table 2	
	11/11/2024
Signature	Date