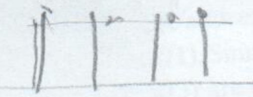
as in Exercise 6.1. The twiddle constants are the same as in Exercise 6.1. Note that the twiddle constant W is multiplied with the second term only (not with the first).



Stage 1

$X(0) = \dots X(3) = 1$

$X(4) \dots X(7) = 0$

$N = 8$, Four Twiddles

$W^0 = 1$

$W^1 = e^{-2\pi j/8} = e^{-i2\pi \frac{k}{N}}$

$W^2 = e^{-j4\pi/8} = -j$

$W^3 = e^{-j6\pi/8} = -0.707 - j0.707$

$$
\begin{aligned}
x(0) + W^0x(4) &= 1 + 0 = 1 \to x'(0)\\
x(0) - W^0x(4) &= 1 - 0 = 1 \to x'(4)\\
x(2) + W^0x(6) &= 1 + 0 = 1 \to x'(2)\\
x(2) - W^0x(6) &= 1 - 0 = 1 \to x'(6)\\
x(1) + W^0x(5) &= 1 + 0 = 1 \to x'(1)\\
x(1) - W^0x(5) &= 1 - 0 = 1 \to x'(5)\\
x(3) + W^0x(7) &= 1 + 0 = 1 \to x'(3)\\
x(3) - W^0x(7) &= 1 - 0 = 1 \to x'(7)
\end{aligned}
$$

where the sequence x's represents the intermediate output after the first iteration and becomes the input to the subsequent stage.

Stage 2

$$
\begin{aligned}
x'(0) + W^0x'(2) &= 1 + 1 = 2 \to x''(0)\\
x'(4) + W^2x'(6) &= 1 + (-j) = 1 - j \to x''(4)\\
x'(0) - W^0x'(2) &= 1 - 1 = 0 \to x''(2)\\
x'(4) - W^2x'(6) &= 1 - (-j) = 1 + j \to x''(6)\\
x'(1) + W^0x'(3) &= 1 + 1 = 2 \to x''(1)\\
x'(5) + W^2x'(7) &= 1 + (-j)(1) = 1 - j \to x''(5)\\
x'(1) - W^0x'(3) &= 1 - 1 = 0 \to x''(3)\\
x'(5) - W^2x'(7) &= 1 - (-j)(1) = 1 + j \to x''(7)
\end{aligned}
$$

where the intermediate second-stage output sequence x''s becomes the input sequence to the final stage.

Stage 3

$$
\begin{aligned}
X(0) &= x''(0) + W^0x''(1) = 4\\
X(1) &= x''(4) + W^1x''(5) = 1 - j2.414\\
X(2) &= x''(2) + W^2x''(3) = 0\\
X(3) &= x''(6) + W^3x''(7) = 1 - j0.414\\
X(4) &= x''(0) - W^0x''(1) = 0\\
X(5) &= x''(4) - W^1x''(5) = 1 + j0.414\\
X(6) &= x''(2) - W^2x''(3) = 0\\
X(7) &= x''(6) - W^3x''(7) = 1 + j2.414
\end{aligned}
$$

which is the same output sequence as found in Exercise 6.1.

6.5 BIT

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6.6 DEV

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of stages.
four stage
summatio

$X($

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X

which rep