

Transformada Discreta de Fourier

Resultados

Ejercicios de Cálculo

1.1.-1.2.

| X[k] | x[n] |
|---|------------------|
| $e^{-j\frac{\pi k(L-1)}{N}} \frac{\text{sen}\left[\frac{\pi kL}{N}\right]}{\text{sen}\left[\frac{\pi k}{N}\right]}$ | $\{0; 0; 0; 1\}$ |

★ 1.3.1.-1.3.2.

| X[k] | Y[k] | Z[k]=X[k]Y[k] | z[n]=x[n]⊗y[n] |
|---|--|---------------|--|
| $\sum_{n=0}^{N-1} x[n]e^{-j\frac{2\pi kn}{N}} = \{0; 2\}$ | $\sum_{n=0}^{N-1} y[n]e^{-j\frac{2\pi kn}{N}} = \{0; -2\}$ | $\{0; -4\}$ | $\frac{1}{N} \sum_{k=0}^{N-1} Z[k]e^{j\frac{2\pi kn}{N}} = \{2; 2\}$ |

★ 1.3.3.-1.3.5

| L{x[k] * y[k]} | x^[n] | y^[n] | X^[k] | Y^[k] |
|----------------|----------------|---------------|---|--|
| 3 | $\{1; -1; 0\}$ | $\{1; 1; 0\}$ | $\sum_{n=0}^{N-1} x[n]e^{-j\frac{2\pi kn}{N}} = 1 - e^{-j\frac{2\pi k}{3}}$ $\left\{0; \frac{3}{2} + j\frac{\sqrt{3}}{2}; \frac{3}{2} - j\frac{\sqrt{3}}{2}\right\}$ | $\sum_{n=0}^{N-1} y[n]e^{-j\frac{2\pi kn}{N}} = -1 + e^{-j\frac{2\pi k}{3}}$ $\left\{0; -\frac{3}{2} - j\frac{\sqrt{3}}{2}; -\frac{3}{2} + j\frac{\sqrt{3}}{2}\right\}$ |

★ 1.3.6.

| Z^[k]=X^[k]Y^[k] | Z^[n]=x^[n]*y^[n] |
|--|--|
| $-\left(1 - e^{-j\frac{2\pi k}{3}}\right)^2 = \left\{0; -3e^{j\frac{\pi k}{3}}; -3e^{-j\frac{\pi k}{3}}\right\}$ $= \left\{0; -\frac{3}{2} - j\frac{3\sqrt{3}}{2}; -\frac{3}{2} + j\frac{3\sqrt{3}}{2}\right\}$ | $\frac{1}{N} \sum_{k=0}^{N-1} Z[k]e^{j\frac{2\pi kn}{N}} = \{1; 2; -1\}$ |

1.4.

| X[k] |
|--|
| $3 + 2e^{-j\frac{\pi k}{3}} + e^{-j\frac{2\pi k}{3}} + e^{-j\frac{4\pi k}{3}} + 2e^{-j\frac{5\pi k}{3}}$ |

| K | 0 | 1 | 2 | 3 | 4 | 5 |
|------|---|---|---|---|---|---|
| X[k] | 9 | 4 | 0 | 1 | 0 | 4 |

1.5.

| X[k] |
|---|
| $-1 - \frac{4}{5}e^{-j\frac{\pi k}{5}} - \frac{3}{5}e^{-j\frac{2\pi k}{5}} - \frac{2}{5}e^{-j\frac{3\pi k}{5}} - \frac{1}{5}e^{-j\frac{4\pi k}{5}} + \frac{1}{5}e^{-j\frac{6\pi k}{5}} + \frac{2}{5}e^{-j\frac{7\pi k}{5}} + \frac{3}{5}e^{-j\frac{8\pi k}{5}} + \frac{4}{5}e^{-j\frac{9\pi k}{5}}$ |

| k | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------|----|------|------|------|------|---|-----|-----|-----|-----|
| X[k] | -1 | -0.8 | -0.6 | -0.4 | -0.2 | 0 | 0.2 | 0.4 | 0.6 | 0.8 |