# TABLA DE LA TRANSFORMADA Z

| | $f(n) = \frac{1}{2\pi j}\oint_l F(z)z^{n-1}dz$ | $Z[f[n]] = F(z) = \sum_{n=-\infty}^{n=+\infty} f[n]z^{-n}$ |
|---|---|---|
| 1 | $af[n] + bg[n]$ | $aF(z) + bG(z)$ |
| 2 | $f[n-k]$ | $z^{-k}F(z)$ |
| 3 | $f[n-k]u[n]$ | $z^{-k}(X(z) + f[-1]z + f[-2]z^2 + \cdots + f[-k]z^k)$ $X(z) = Z[f[n]u[n]] \quad , \quad k > 0$ |
| 4 | $f[n+k]u[n]$ | $z^k\left(X(z) - f[0] - f[1]z^{-1} - \cdots - f[k-1]z^{-(k-1)}\right)$ $X(z) = Z[f[n]u[n]] \quad , \quad k > 0$ |
| 5 | $a^n f[n]$ | $F(z/a) \quad , \; a \in \mathbb{C}$ |
| 6 | $e^{jan}f[n]$ | $F(e^{-ja}z)$ |
| 7 | $f[an]$ | $F(z^{\frac{1}{a}}) \quad , \quad a \in \mathbb{Z} - \{0\}$ |
| 8 | $f[-n]$ | $F(1/z)$ |
| 9 | $\Delta f[n] = f[n+1] - f[n]$ | $(z-1)F(z)$ |
| 10 | $\Delta^2 f[n]$ | $(z-1)^2F(z)$ |
| 11 | $\sum_{k=0}^{p} f[n-k]$ | $F(z)\frac{1-z^{p+1}}{1-z}$ |
| 12 | $nf[n]$ | $-zF'(z)$ |
| 13 | $-\frac{f[n+1]}{n}$ | $\int_z^{\infty} F(v)dv$ |
| 14 | $f[n] * g[n] = \sum_{k=-\infty}^{k=+\infty} f[k]g[n-k]$ | $F(z)G(z)$ |
| 15 | $f[n]g[n]$ | $F(z) * G(z) = \frac{1}{2\pi}\int_I \frac{F(z)G(z/x)}{x}dx$ |
| 16 | $f[n] = f[n+T]$ | $\frac{1}{1-z^{-T}}\left(f[0] + f[1]z^{-1} + \cdots + f[T-1]z^{-(T-1)}\right)$ |

| | CAUSAL<br>$f[n]$: Señal causal ($n \geq 0$) | |
|---|---|---|
| | $f[n] = \frac{1}{2\pi}\oint_l F(z)z^{n-1}dz$ | $Z[f(n)] = F(z) = \sum_{n=0}^{n=+\infty} f[n]z^{-n}$ |
| 17 | $f[n+k]u[n]$ | $z^k\left(F(z) - f[0] - f[1]z^{-1} - \cdots - f[k-1]z^{-(k-1)}\right)$<br>$k > 0$ |
| 18 | $f[n-k]u[n]$ | $z^{-k}F(z) \quad , \quad k > 0$ |
| 19 | $\Delta f[n] = f[n+1] - f[n]$ | $(z-1)F(z) - zf[0]$ |
| 20 | $\Delta^2 f[n]$ | $(z-1)^2F(z) - z(z-2)f[0] - zf[1]$ |
| 21 | $f[n] * g[n] = \sum_{k=0}^{k=\infty} f[k]g[n-k]$<br>$g[n]$: Señal causal | $F(z)G(z)$ |

## TRANSFORMADA Z - CASOS ESPECIALES

| | $f[n]$ | $Z(f[n]) = F(z)$ |
|---|---|---|
| 22 | $\delta[n]$ | $1$ |
| 23 | $\delta[n-k]$ | $z^{-k}$ |
| 24 | $u[n]$ | $\frac{1}{(1-z^{-1})}$ , $ROC: \lvert z\rvert > 1$ |
| 25 | $a^n u[n]$ | $\frac{1}{1-az^{-1}}$ , $ROC: \lvert z\rvert > \lvert a\rvert$ |
| 26 | $na^n u[n]$ | $\frac{az^{-1}}{(1-az^{-1})^2}$ , $ROC: \lvert z\rvert > \lvert a\rvert$ |
| 27 | $a^n u[-n-1]$ | $\frac{-1}{1-az^{-1}}$ , $ROC: \lvert z\rvert < \lvert a\rvert$ |
| 28 | $na^n u[-n-1]$ | $\frac{-az^{-1}}{(1-az^{-1})^2}$ , $ROC: \lvert z\rvert < \lvert a\rvert$ |
| 29 | $\cos(an)u[n]$ | $\frac{1-z^{-1}\cos(a)}{1-2z^{-1}\cos(a)+z^{-2}}$ , $ROC: \lvert z\rvert > 1$ |
| 30 | $\text{sen}(an)u[n]$ | $\frac{z^{-1}\text{sen}(a)}{1-2z^{-1}\cos(a)+z^{-2}}$ , $ROC: \lvert z\rvert > 1$ |
| 31 | $(a^n\cos(an))u[n]$ | $\frac{1-az^{-1}cos(a)}{1-2az^{-1}\cos(a)+a^2z^{-2}}$ , $ROC: \lvert z\rvert > \lvert a\rvert$ |
| 32 | $(a^n\text{sen}(an))u[n]$ | $\frac{1-az^{-1}\text{sen}(a)}{1-2az^{-1}\cos(a)+a^2z^{-2}}$ , $ROC: \lvert z\rvert > \lvert a\rvert$ |