Tabelul 5.1 Proprietăţile seriei Fourier în timp discret

Semnalul discret periodic	Coeficienţii seriei Fourier exponenţiale
$x[n]\ ,\ x[n+N] = x[n] = x[(n)_N]$	$\{c_k^x\}\ ;\ c_{k+N}^x = c_k^x = c_{(k)_N}^x$
$y[n]\ ,\ y[n+N] = y[n] = y[(n)_N]$	$\{c_k^y\}\ ;\ c_{k+N}^y = c_k^y = c_{(k)_N}^y$
$a\,x[n] + b\,y[n]$	$\{a c_k^x + b c_k^y\}$
$x[n-n_o]\ ,\ n_o \in \mathbb{R}$	$\left\{e^{-jk\frac{2\pi}{N}n_o} c_k^x\right\}$
$x^*[n]$	$\{(c_k^x)^*\}$
$x[-n]$	$\{c_{-k}\}$
$x_{(m)}[n] = \begin{cases} x[n/m] & ,\ n \vdots m \\ 0 & ,\ \hat{\imath}n\ rest \end{cases}$ $perioada\ mN$	$\left\{\frac{1}{m} c_k^x\right\}\ ;\ perioada\ mN$
$x[n] \otimes y[n] = \sum_{k \in <N>} x[k]\,y[n-k]$	$\{N c_k^x c_k^y\}$
$\frac{1}{N_o}\sum_{n=0}^{N_o-1} x^*[n]\,y[n+k]$	$\{(c_k^k)^* \cdot c_k^y\}$
$x[n] \cdot y[n]$	$\{c_k^x \otimes c_k^y\} = \left\{\sum_{m \in <N>} c_{k-m}^x c_m^y\right\}$
$x[n] - x[n-1]$	$\left\{\left(1-e^{jk\frac{2\pi}{N}}\right) c_k^x\right\}$
$\sum_{k=-\infty}^{n} x[k]\ ;\ c_o^x = 0$	$\left\{c_k^x \Big/ \left(1-e^{-jk\frac{2\pi}{N}}\right)\right\}\ ,\ c_o^x = 0$
$x[n] \in \mathbb{R}$	$c_k = (c_{-k})^*$ $\lvert c_k\rvert = \lvert c_{-k}\rvert\ ;\ \mathrm{Arg}\,c_k = -\mathrm{Arg}\,c_{-k}$ $\mathrm{Re}\{c_k\} = \mathrm{Re}\{c_{-k}\}\ ;\ \mathrm{Im}\{c_k\} = -\mathrm{Im}\{c_{-k}\}$
$x_p[n]\ ,\ x[n] \in \mathbb{R}$	$\{\mathrm{Re}\{c_k^x\}\}$
$x_i[n]\ ,\ x[n] \in \mathbb{R}$	$\{j\,\mathrm{Im}\{c_k^x\}\}$
$\sum_{n=-\infty}^{\infty} \lvert x[n]\rvert^2 = \frac{1}{2\pi}\int_{2\pi} \lvert X(\Omega)\rvert^2 d\Omega$	

Tabelul 5.2 Proprietăţile transformării Fourier în timp discret

Semnalul discret aperiodic	Transformata Fourier
$x[n]$	$X(\Omega) \quad ; \quad X(\Omega + 2\pi) = X(\Omega)$
$y[n]$	$Y(\Omega) \quad ; \quad Y(\Omega + 2\pi) = Y(\Omega)$
$a\,x[n] + b\,y[n]$	$a\,X(\Omega) + b\,Y(\Omega)$
$x[n - n_o]$	$e^{-j\Omega n_o} X(\Omega)$
$e^{j\Omega_0 n}\,x[n]$	$X(\Omega - \Omega_0)$
$x^*[n]$	$X^*(-\Omega)$
$x[-n]$	$X(-\Omega)$
$x_{(k)}[n] = \begin{cases} x[n/k] & , \quad n \vdots k \\ 0 & , \quad \hat{\imath}n \;\; rest \end{cases}$	$X(k\Omega)$
$x[n] * y[n]$	$X(\Omega)\,Y(\Omega)$
$\breve{x}^*[k] * y[k]$	$X^*(\Omega)\,Y(\Omega)$
$x[n]\,y[n]$	$\frac{1}{2\pi} X(\Omega) \otimes Y(\Omega) = \frac{1}{2\pi} \int_{2\pi} X(u)\,Y(\Omega - u)\,du$
$x[n] - x[n-1]$	$\left(1 - e^{-j\Omega}\right) X(\Omega)$
$\sum_{k=-\infty}^{n} x[k]$	$\frac{X(\Omega)}{1 - e^{-j\Omega}} + \pi X(0) \sum_{k=-\infty}^{\infty} \delta(\Omega - k\,2\pi)$
$n\,x[n]$	$j \frac{d}{d\Omega} X(\Omega)$
$x[n] \in \mathbb{R}$	$X(\Omega) = X^*(-\Omega)$ $\lvert X(\Omega) \rvert = \lvert X(-\Omega) \rvert \;;\; \mathrm{Arg}X(\Omega) = -\mathrm{Arg}X(-\Omega)$ $\mathrm{Re}\{X(\Omega)\} = \mathrm{Re}\{X(-\Omega)\} \;;\; \mathrm{Im}\{X(\Omega)\} = -\mathrm{Im}\{X(-\Omega)\}$
$x_p[n] \; , \; x[n] \in \mathbb{R}$	$\mathrm{Re}\{X(\Omega)\}$
$x_i[n] \; , \; x[n] \in \mathbb{R}$	$j\,\mathrm{Im}\{X(\Omega)\}$
$\sum_{n=-\infty}^{\infty} \lvert x[n] \rvert^2 = \frac{1}{2\pi} \int_{2\pi} \lvert X(\Omega) \rvert^2 d\Omega$	

Tabelul 5.3. Perechi semnal-transformată Fourier în timp discret

Semnalul	Transformata Fourier	Coeficienţii seriei Fourier exponenţiale (pentru) semnale periodice
$\sum_{k\in\langle N\rangle} c_k e^{jk\frac{2\pi}{N}n}$	$\sum_{k=-\infty}^{\infty} 2\pi c_k \delta(\Omega - k\frac{2\pi}{N});\quad c_k = c_{(k)_N}$	$\{c_k\}$
$e^{j\Omega_0 n}$	$\sum_{k=-\infty}^{\infty} 2\pi\delta(\Omega - \Omega_0 - k2\pi)$	$\frac{\Omega_0}{2\pi} = \frac{m}{N} \in Q: \{c_k\};\ c_k = \begin{cases} 1, (k)_N = m \\ 0, rest \end{cases}$ $\frac{\Omega_0}{2\pi} \notin Q;$ *semnalul nu este periodic*
$\cos\Omega_0 n$	$\sum_{k=-\infty}^{\infty} \pi[\delta(\Omega - \Omega_0 - k2\pi) + \delta(\Omega + \Omega_0 - k2\pi)]$	$\frac{\Omega_0}{2\pi} = \frac{m}{N} \in Q: \{c_k\};\ c_k = c_{-k} = \begin{cases} 1/2, (k)_N = m \\ 0, rest \end{cases}$ $\frac{\Omega_0}{2\pi} \notin Q;$ *semnalul nu este periodic*
$\sin\Omega_0 n$	$\sum_{k=-\infty}^{\infty} \frac{\pi}{j}[\delta(\Omega - \Omega_0 - k2\pi) + \delta(\Omega + \Omega_0 - k2\pi)]$	$\frac{\Omega_0}{2\pi} = \frac{m}{N} \in Q: \{c_k\};\ c_k = \begin{cases} 1/(2j), k = m \pm pN \\ -1/(2j), k = -m \pm pN \\ 0, rest \end{cases}$ $\frac{\Omega_0}{2\pi} \notin Q;$ *semnalul nu este periodic*
x[n]=1	$\sum_{k=-\infty}^{\infty} 2\pi\delta(\Omega - k2\pi)$	$c_k = \begin{cases} 1, (k)_N = 0 \\ 0, rest \end{cases}$
$x[n] = \begin{cases} 1, & \lvert n\rvert \le N_1 \\ 0, & N_1 \le \lvert n\rvert \le N/2 \end{cases}$ $x[n+N] = x[n]$	$\sum_{k=-\infty}^{\infty} 2\pi \frac{\sin(\frac{2N_1+1}{2}\frac{2k\pi}{N})}{N\sin\frac{2k\pi}{N}} \delta(\Omega - k\frac{2\pi}{N})$	$c_k = \frac{\sin(\frac{2N_1+1}{2}\frac{2k\pi}{N})}{N\sin\frac{2k\pi}{N}}\ (k)_N \ne 0;\quad c_k = \frac{2N_1+1}{N}; (k)_N = 0$

Semnalul	**Transformata Fourier**	**Coeficienţii seriei Fourier exponenţiale (pentru) semnale periodice**
$\sum_{k=-\infty}^{\infty} \delta[n-kN]$	$\frac{2\pi}{N}\sum_{k=-\infty}^{\infty} \delta(\Omega - k\frac{2\pi}{N})$	$c_k = \frac{1}{N}$
$a^n \sigma[n]; \quad \lvert a\rvert < 1$	$\frac{1}{1-ae^{-j\Omega}}$	-
$x[n]=\begin{cases}1, & \lvert n\rvert \le N_1 \\ 0, & \lvert n\rvert > N_1\end{cases}$	$\frac{\sin[(2N_1+1)/2]\Omega}{\sin(\Omega/2)}$	-
$\frac{\sin \Omega_0 n}{\pi n}; \quad 0<\Omega_0<\pi$	$X(\Omega)=\begin{cases}1, & \lvert\Omega\rvert<\Omega_0 \\ 0, & \Omega_0<\lvert\Omega\rvert\le\pi\end{cases}; X(\Omega+2\pi)=X(\Omega)$	-
$\delta[n]$	1 (constanta)	-
$\sigma[n]$	$\frac{1}{1-e^{-j\Omega}}+\pi\sum_{k=-\infty}^{\infty}\delta(\Omega-k2\pi)$	-
$\delta[n-n_0]$	$e^{-j\Omega_0 n}$	-
$(n+1)a^n\sigma[n]; \quad \lvert a\rvert<1$	$\frac{1}{(1-ae^{-j\Omega})^2}$	-
$\frac{(n+m-1)!}{n!(m-1)!}a^n\sigma[n]; \quad \lvert a\rvert<1$	$\frac{1}{(1-ae^{-j\Omega})^m}$	-