* Watch Video 3.6

* DT Fourier series representation

Subject :

Representation :

Given N

Synthesis formula

Analysis formula

* Two methods of finding a_k : ① Inspection &

② direct computation.

* An easy way to remember ☐

$a_{-N}\ a_{-N+1}\ \cdots\cdots\ a_{-1}$

$\rightarrow a_0\ a_1\ a_2\ \cdots\cdots\ a_{N-1}$

$a_N,\ a_{N+1},\ \cdots\ a_{2N-1}$

Note Title 2/23/2012

* Properties of DT FS

Selected properties (See Table 3.2 p.221 for a detailed list of properties)

1. Linearity

$$x[n] \xleftrightarrow{F.S.} a_k, \frac{2\pi}{N}$$

$$y[n] \xleftrightarrow{F.S.} b_k, \frac{2\pi}{N}$$

$$z[n] = Ax[n] + By[n] \xleftrightarrow{F.S.}$$

Write down your own comparison to CT FS.

2. Time-Shift

$$x[n] \longleftrightarrow a_k, \frac{2\pi}{N}$$

$$y[n] = x[n-n_0] \longleftrightarrow$$

3. Time-Reversal

$x[n] \xleftrightarrow{FS} a_k, \frac{2\pi}{N}$

$y[n] = x[-n] \xleftrightarrow{FS}$

Comparison to CTFS

$a_{-N} \quad a_{-N+1} \quad \cdots \quad a_{-1}$

$a_0 \quad a_1 \quad a_2 \quad \cdots \quad a_{N-1}$

$a_N, \ a_{N+1}, \ \cdots \quad a_{2N-1}$

So we often write

4 Multiplication

$x[n] \xleftrightarrow{FS} a_k, \frac{2\pi}{N}$

$y[n] \xleftrightarrow{FS} b_k, \frac{2\pi}{N}$

$z[n] = x[n] \cdot y[n] \xleftrightarrow{FS}$

Comparison to CTFS.

Ans: $\boxed{\quad}$ Similar to the convolution sum, but is different as the summation is not over $\boxed{\quad}$

We term it the $\boxed{\text{"} \quad \text{"}}$ convolution.

Example: Given $N=5$ &

$$x[n] \xleftrightarrow{F.S} a_0, \cdots, a_4, \frac{2\pi}{5}$$

$$y[n] \xleftrightarrow{F.S} b_0, \cdots, b_4, \frac{2\pi}{5}$$

$$z[n] = x[n] \cdot y[n] \longleftrightarrow c_0, \cdots, c_4, \frac{2\pi}{5}$$

Q: Express c_2 in terms of a & b.

Ans: