

LNCT GROUP OF COLLEGES



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| IIR:-have zeros & poles | Q. Determine two pt DFT of Requesce $x(m) = \frac{1}{2} 1, -1$ |
|---|--|
| + Discrete fourier Jromsform :- | Here $N=2$. $\chi(k) = \xi \chi(n) c N$. n=0 and $k=0,1$. |
| SE XIU) & DTS, IG N | and K=0,1. |
| pt DFT is given as- | |
| $X(K) = \frac{1}{2} \times \frac{1}{N} \cdot \frac{1}{N}$ | $:. \chi(k) = 1. e^{-j2\pi.m.0} + (-1)e^{-j2\pi.m.1}$ |
| | = 1 - e |
| where $K = 0, 1, 2, \dots, N-1$. | FILE Bailt Ball Former |
| and N pt IDFT is given as- | $x(0) = a(0) \cdot e^{-j \pi \cdot 0} + a(1) e^{-0} \cdot (0)$ |
| $\mathcal{K}(m) = \frac{1}{2} \in \mathcal{K}(k) \in \mathbb{N}$ N k_{20} | x(0) > 0 $x(0) = 0$ $x(0) = 0$ |
| N K20 | ×(0)=0 = = 1 3 1- 5 (0)10 + |
| Where m= 0, 2,; N-1 | |
| e N = WN a | $\chi(1) = \alpha(0) \cdot e^{-\frac{3}{2}n/2} \cdot 0 - 1 + 1 = 0$ m(1) $\cdot e^{-\frac{3}{2}n/2} \cdot 1 \cdot 1$ |
| | File maine 17 to the bar |
| xloserson | = 1- (COST-95mT) |
| SH & WA. "TWIDDLE FACTOR" | X(1) = 20 mai - jan 00] 1 + |
| (A) FACTOR I = CINE | * *10)=0 - for K=0. |
| tos terms of twiddle factor. | X(1) = 2 for k=1. |
| DET is - (a) + (a) - (a) | X(1) = 43 + 43/3 , 2 - (1)X |
| | $X(K) = \frac{10}{20}, 2\frac{3}{20}, 2\frac$ |
| $\chi(k) = \sum_{k=0}^{N-1} \chi(k) \cdot \chi_N^{Mk}$ | LX(K) = 30.03 = (x)x+ |
| and the second s | n102 (((() () () () () () () () |
| cohere, K= 0,11, 1215 M-2 S= (m) | mis) (t) (t) mis) |
| and IDFT & Later and slow | Jwo pt DFT |
| x(m) = 1 (2 - x(4) Win 2 f=(m) = 2 | JWO PT DFT |
| N. 24.30 EU S COMP | 1th sample => Superfor month mix)] : 2nd sample => diffinition mon & mix) |

Qo. Determine three point PPT $\chi(2)$, = $\pm + \left[- \frac{y_2}{2} + \right] \frac{y_3}{2}$ **TODWRITEWELL** of $\chi(m) = \{ 1, 43, 1 \}$. + [1/2 + j J3/2] Page Deerete - fourier Immetton Here, N=3, K=0,1,2. $\therefore X(k) = E Z(n) \cdot e^{-j \frac{2\pi}{N} \cdot n \cdot k}$. μ_{20} $= 1 - \frac{1}{6} - \frac{53}{3 \cdot 2j} - \frac{1}{2} + \frac{53}{2j}$ = 6-1-3 - Jaj[1+1] $K(0) = \chi(0) \cdot e + \frac{j 2\pi}{3} \cdot 0 \cdot 0 + \frac{j 2\pi}{3} \cdot 1 \cdot 0 + \chi(2) \cdot e^{-j 2\pi}$ = 2 - 3; [-2] X(2) > 1/3 - 155] - 13 - 10 = X H = 1. e+ 1/3 e + 1. e $\chi(0) = \frac{2 + 1/3}{2} = \frac{7/3}{3} \cdot \frac{1}{3} \cdot$ · · ×(0) = 7/3.0 $x(1) = \frac{1}{3} + \frac{1}{53}$ X(2) = 1/3 - 1/35 J $= 1.e^{0} + 13.e^{-j^{2}\pi/3} + 1e^{-j^{4}\pi/3}$ Jhree point DFT of all) > 21, 1/3/ is - 1003 = 4 3 1 + 1/3 [cos 27/3 - j 8m 27/3] + 1 [cos 47/3 - j 8m 41/3] $X(1) = \int \left(\frac{1}{3}\right)^2 + \left(\frac{1}{3}\right)^2 = 2 \frac{1}{400} \left(\frac{3}{3}\right)^2$ $= 1 + \frac{1}{3} \left[\frac{1}{2} + \frac{1}{2}$ terms of trouddle daster. $\chi(2) = \left(\frac{1}{3}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2 - \frac{1}{\sqrt{3}}$ X(1) = 43 + 33/3j $\frac{\chi(2) = \chi(0) \cdot e^{-j\frac{2\pi}{3} \cdot 0 \cdot 2} - j\frac{2\pi}{3} \cdot 1 \cdot 2}{+\chi(2) \cdot e^{-j\frac{2\pi}{3} \cdot 2 \cdot 2} + \chi(1) \cdot e^{-j\frac{2\pi}{3} \cdot 2 \cdot 2} = (\chi)\chi$ Do. Determine in four point DAT $p_{\chi(m)} = \frac{1}{2}\chi(p), \chi(1), \chi(1), \chi(2), \chi(3)$ 1 - 1/3 e + 1 e 8/3j " (05 4) - j 8m 4) - 1/3 T-10 19 001 non)= cosmitters + and bo $\frac{1}{2} a(m) = \frac{2}{2} \frac{1}{12} \frac{1}{$

| M-1 -j2F. nok. | $X(3) = n(0) e^{-j\frac{2\pi}{4}\cdot 3\cdot 0}$ |
|--|--|
| "; X(K) = Ex(n).e. N. n.K. N=0 | |
| N=3, K=0,1+2,3, | mls). $e^{\int 2\pi \cdot 3 \cdot 1} + Page$ |
| $\pi(0) = \pi(0) \cdot e^{-j \frac{2\pi}{4}, 0 \cdot 0} +$ | |
| $\begin{array}{c} \lambda(0) = \lambda(0) \cdot e^{-j} \frac{4}{4} + \frac{-j \frac{2\hbar}{4} \cdot 2 \cdot 0}{-j \frac{2\hbar}{4} \cdot 3 \cdot 0} \\ \eta(1) \cdot e^{-j \frac{2\hbar}{4} \cdot 3 \cdot 0} + \eta(2) \cdot e^{-j \frac{2\hbar}{4} \cdot 3 \cdot 0} \\ + \eta(3) \cdot e^{-j \frac{2\hbar}{4} \cdot 3 \cdot 0} \end{array}$ | $n(2) \cdot e^{-j\frac{2}{4}R \cdot 3\cdot 2} + n(3) \cdot e^{-j\frac{2}{4}R \cdot 3\cdot 3}$ |
| - j20-3.0 | |
| + m(3), e ~ | - 3/271 - 97/2i |
| | $= 1 + 1 + \frac{3}{2} - \frac{3}$ |
| $= 1.e^{\circ} + 1.e^{\circ} + 0 - 1.e^{\circ}$ UZ VZ | |
| 02 | $= 1 + 1 \left[\cos 3\pi - j \sin 3\pi \right]$ |
| x(o)= 1. | 1-1 |
| -12A - 12A - 12A | $-\frac{1}{\sqrt{2}}\left[\frac{\cos q\pi - j\sin g\pi}{2}\right]$ |
| x(1) = n(0). e + n(1).e | J2 - 2 J 2 J. |
| $+ \eta(2) - e^{-j\frac{2\pi}{4} \cdot 2 \cdot 1} + \eta(3) \cdot e^{-4}$ | X(2) = 11521 |
| ten - (sheri) da - éach | $x(2) = 1 + J_{2j}$ |
| $= 1 + 1 - \pi [2] + \pi - 1 - 5\pi [4]$ | |
| $= 1 + 1 \cdot e^{-\pi/2j} + 0 - 1 \cdot e^{-\pi/4j}$ $\sqrt{2}$ | - MARY KET 1 - A MARTA |
| | |
| $\frac{1}{\sqrt{12}} \frac{1}{\sqrt{2}} \frac{1}{2$ | :. $\chi(K) = \{1, 1 - \sqrt{2}, 1, 1 + \sqrt{2}\}$ |
| | |
| | Deduction - hand |
| $= \frac{1}{1} + \frac{1}{1} \begin{bmatrix} 0 - j \end{bmatrix} - \frac{1}{1} \begin{bmatrix} 0 + j \end{bmatrix}$ | |
| S P24 2 2 2 2 Colles and | °? In terms of toolddle factor. |
| = 1 - 1 j - 1 j = 1 - J2 j J2 j J2 j | $\chi(K) = E \chi(m)$. W. |
| 02J J2J J | $\chi(K) = E^{-\chi(m)} \cdot W_{N}^{m \cdot k}$ |
| X(1) = 1- J2 Just - (N1X 3 = (1)X | N20 |
| ISE ISEN ISE | we win (altern) |
| $\chi(2) = \chi(0) \cdot e + \chi(2) \cdot e + \chi(2$ | N(0) = X(0) + N(1) + N(3) |
| $+ 2(2) e^{-j2\pi/4-2.2} + 2(3)e^{-j2\pi/4-2.3}$ | x(12) = n(0) + x(12) w' + n6) w"+ berg |
| helete +Color + Color + Color + Color | |
| $\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} + 1$ | 7(2) = 2(0) + 2(2) w2 + 2(2) w4 + 2(3) w6. |
| $\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = 1$ | x(2) 5 x(0) + x(2) w + x(2) w + (1) 5) w + |
| | WN=1.e - J277 = rejo. |
| $2 1 \pm 1 \int \cos \pi - j \sin \pi \int - \int \cos 3\pi$ | $(1-) \cdot (1-3) = 1$ |
| + V2 Ling have (nix + (a) the | (1-) ((1 - 3) - |
| = [8m 25] : Caw (etm | STREL STRE |
| 11-1+(1-1x0+(1-)1++++ | unit = (the false = |
| $\frac{-2^{10} \pm 1}{\sqrt{2}} + 1 \left[-1 - 0 \right] - \frac{1^{10} \left[-1 - 0 \right]}{\sqrt{2}} $ | -1 povorg 1 |
| | |
| $\chi(2) = 1$ | |
| | |

· properties of Iwiddle factor ?for N=4. MBD WRITEWEL w4= It is always periodic fru. w 4 2 W 4 1 15 W = 1 (KTH) = WNK. 2-WH WN (KATN) = WNK. proof :- let WM = e N for half periodicity $= \underbrace{ \left(\underbrace{e}_{N} \right) }_{e} \underbrace{ \left(\underbrace{k+rN}_{N} \right) }_{e} \underbrace{ \int_{N}^{2R} \cdot k}_{e}$ $\frac{1}{104^{3}} = \frac{1}{104} \frac{(1+4)^{2}}{2} = \frac{1}{104}$ $\frac{1}{104} = \frac{1}{104} \frac{1}{104} = -\frac{1}{104}$ = e-j27. k. (e-j27)8. H. = e-j2/1/1/K = WN [ist+1 41-Doks- Shostell method, 1+0T1-[-0T1+2 = $lor x(m) = \{1, \frac{1}{52}, 0, \frac{1}{52}\}$ " An terms of looghold Half Periodicity :-X(K)= Excension with a com W_N $(K+N|_2) = -W_N K.$ six + ... (z)x + (0)x = (0)x1000 :- (() Wig '= (=) 2 / () = (1) x(0) = n(0) + n(1) + n(2) + n(3) = 1. Int. (e-J2R) (K+N/2) (-j2r) K. $\chi(1) = \frac{3}{2} \chi(n) \cdot w_{1} n \cdot \overline{w}_{1}$ $\pi c_{M2} = \frac{1}{2} \frac{1}{$ $= \left(e^{-j\frac{k}{N}}\right)^{k} \cdot \left(-1\right)^{k}$ = n(0) + n(1) w4 + n 121 w4 + m(3) Wy 3 . [88 83] = = - (e^{-j2n})k = -w.K. proved, $= 1 + 1 (-1) + 0 \times (-1) + (-$ 1 =

| X12) | $x(0) + x(1) \cdot w_4^2 + x(2) w_4^4 +$ | XID - 1 23 2120 Mar Pour District |
|-----------|--|--|
| | | $x(0) = \frac{1}{4} \stackrel{e}{\underset{u=0}{\xi = 0}} \frac{1}{2} \frac$ |
| 01 | 13) . W46 | Date |
| 2 | 1 + 1 (-1) + 0 + (-1) (-1) | $= \frac{Page}{4} \left[\frac{m(o) + m(1) + m(2) + m(a)}{4} \right]^{\frac{1}{2}}$ |
| TenaT | $\frac{1+1(-1)+0+(-1)(-1)}{\sqrt{2}}$ | A La have J |
| (112 | 1-1-1-1-5-1- 1018-1 | -1[++(1-52)+1+1+52]] |
| Cela | $\frac{1-1}{52} + \frac{1}{52} + \frac{1}{52$ | |
| 1 | | 2 3 3 600 |
| XIADO | n(0) + n(1) wy + n12) wy + | 2 3 3 6 10 |
| DX18 | n (3) · w. 9 | egen - |
| 1. | 101.004 | $\alpha(L) = 1 \xi \alpha(k) \cdot (\mu, -k)$ |
| fcorte | $\frac{1}{1} + \frac{1}{1} + \frac{1}$ | $\eta(L) = 1 \in \alpha(k) \cdot co_{4} + k \cdot \frac{1}{4} + \frac{1}{4} = 0$ |
| 12=10 | $1 + \frac{1}{\sqrt{2}} \begin{pmatrix} 2 \\ -1 \end{pmatrix} + 0 + \begin{pmatrix} -1 \\ -1 \end{pmatrix} \begin{pmatrix} -1 \\ -1 \end{pmatrix} \begin{pmatrix} -1 \\ -1 \end{pmatrix}$ | 21 [MO) WIT + X(1). WIT + |
| Italine. | 1+ 1+ 1+ 2 1+ 51 | $= \frac{1}{4} \left[\frac{40}{2} w_{4}^{2} + \frac{1}{2} (1) w_{4}^{-1} + \frac{1}{2} \frac{1}{2} w_{4}^{-2} + \frac{1}{2} (3) w_{4}^{-3} \right]$ |
| (sid) | 1 + j + j = 1 + J = 1 + J = j J = J = J = J = J = J = J = J = J = J = | The second design of the second secon |
| | Con Marine State | $= \frac{1}{4} \left[1.1 + (1-52)^{2} + 1.(-1) \right]$ |
| ×(K); | ≥ Z 1, 1-J2j, 1, 1+J2j] | 4 |
| (roto) | | $+ (1+52^{2}).(-3)]$ |
| Note - | for DFT + lockweie | ALL ALL (MIN B ECX) |
| Celler | 1DFT +1-omficlockwise | = 1 [X +]+ J2 - X -] + J2] |
| (strc | it are the second and | 46 1-11 10000 |
| for | 1DFT | = 252 = J2 = 1/5 |
| V = | 1 W4 - 54-1 | = 252 = 52 = 1/52.14 |
| - | WH = | 0.5.6 G2N |
| | | $\alpha(2) = 1 \in \alpha(R), W_{4}^{2K}.$ |
| | I La martin n mit a martin | Finite 1 Kood (115 + 1016 = (+)x |
| -1=1046 | $w_{4}^{2} = u_{24}^{2} = 1$ | = 1 [oc(o). wy 4 ×(1). wy + |
| -(2 1 | | 4 1 1 1 1 1 1 1 1 |
| or Corlor | 10 T TO WIT WIT - 1 MT | $\chi(2) \cdot w_4 + \chi(3) \cdot w_6 = 1$ |
| | | 1 (1-11) 2 - (1-11) |
| | X(R)= E alk) e hi x | |
| alm) | = 1 & x(k), wn | $= 1 [1.(1) + (1+J_2)(-1) + 1 [1+J_2) + (1+J_2) + (1+$ |
| 1 | ************************************** | a(2) = 0 (1-12) (1-12) www. (1-12) |
| | n=0,1,2, | start is a local built for the second |
| | (442 BATS 1 AHA) SCATA | m (3) = 1 & x1K) . W4 3K. |
| 2(2) | = 1 & X(K), WN THK. 4 KTO | 4 keo |
| | 4 K-50 | 213) = 1/52. |
| | | and the second sec |

| . e | |
|--|---|
| Q: for N= 8 | TER STAR SALE FAST MED WRITEWELL |
| wg ⁶ = w8 | -Date Page |
| Wal2 5 11 1 14 | (1.1) / F B A (2-1) R 2 @ |
| $\frac{1}{42} = \frac{1}{42} $ | x(0) 1 1 1 1 Tom |
| | X(1) 9 00 1 WN NI |
| and start and start | $\chi_{(2)} = 1 W_N^2 \dots W_N^2 \dots \eta_1$ |
| 2 W3 W3 ² | |
| | X(NH) La to the WN XIN |
| wg wg 2 | |
| Q14) = 1 (E. A. (E) (O) = 5 (| Exes. |
| A & B | |
| | (-x(0) - 2 - 1 1 1 46 |
| H -> DFT and IDFT as frear | |
| Transformation | |
| | ×(3) 1 W4 W4 L M13 |
| (1-). + "(ja-1) + 1. + T ! = | X MAN |
| Since, DFT > | 「「日本」、と、「三一」、上岸 =(メ)と |
| HL N-1(1-).(157+1) + | $=$ 1 1 1 $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ |
| X(K)= E x(m). Wy | Simplands - J T 72 JA - 2 M |
| [56 + 1 + 30 - 56 + 1 + X] = | 1 L NFT 1 MEL ECLERCE |
| K20,1,N-1 | $\begin{bmatrix} 1 & \overline{j} & -1 & -\overline{j} \end{bmatrix}$ |
| = 2.75 > .72 - 1/52 - 1-M | me TDET |
| $H_{(0)} = \frac{1}{2} (x(n)) = x(0) + x(1) + x(0) + x$ | Qo. Determine DFT of the |
| 420 020 | sequence - |
| aba 1 - E To Cain S I = (1) | |
| X(+) = n(0) + n(1). W + n12) W + + | $m(m) = \frac{3}{2} \frac{1/4}{14} = 0 \le m \le 2$ |
| + W. (Mis + + calmers) - un | 1 = au - aco (o otherwise - d |
| L J P | |
| $\sum_{n=1}^{2} \sum_{n=1}^{\infty} (n-1) = \sum_{n=1}^{\infty} \alpha(n) \cdot \omega_n = 2$ | The I Nice point DFT of Min) |
| * x(N-1) = & 2(u). Way = | Mal Comme |
| + (1-1(*28+1) + (1)+ T 1 = | $\chi(K) = E \alpha(u) e^{\int 2\pi \cdot u \cdot K}$ |
| m(0) + m(1) = w(1) +) = = + 1 | WIN . CAUSA JUL = (MSA |
| a(N-1) - WN (N-1) (N-1) () - (1)x | |
| Server a start of the server o | |
| Ilie can pier despressed = della | a(m)= (44, 44, 44) |
| matrix. | Almin = E E X(K) . WILL ME . |
| 2(3)= 4/52. | OF X P |
| | |

.

 $i, \chi(K) = \frac{1}{4} \left[1 + e^{j\omega} + e^{j2\omega} \right]$ $\pi(\kappa) = \sum_{k=0}^{N-1} \alpha^{k} e^{-j\frac{2\pi}{N}} \frac{\lambda}{\lambda} = 1 - (\alpha e^{-j\frac{2\pi}{N}} \frac{\lambda}{\lambda}) e^{-j\frac{2\pi}{N}}$ Wo 27K $\frac{-j_{2\pi k}}{4} = \frac{-j_{2\pi k}}{4} = \frac{1}{2\pi k} = \frac{1}{2$ 1 - ae jankin $\chi(K) = 1 - a^{N} - a_{N}$ $1 - ae^{-j 2\pi n K N}$. Hence, $X(K) = 1 \cdot e^{-j\frac{2\pi}{3}K} \left[1 + 2 \cos(2\pi k) \right]$ X(K) = 4where $K = 0, 1, \dots, N-1$ Que Determine IDFT of Do. Determines DFT of sequence $\pi(K) = \frac{2}{3}, (2+j), 1, (2-j)$ NH XIK) e J2KAK. N X=0 N X=0 $n(n) = 5 \frac{1}{5} - 1 \leq n \leq 1$ N=4, a(n)=1 & x(k) e = 4 K20 $x(n) = \left(\begin{array}{c} 1 \\ 5 \\ 5 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 5 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 5 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 5 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c} 1 \\ 1 \end{array} \right) \left(\begin{array}{c} 1 \end{array} \right) \left(\begin{array}{c}$ when $m \ge 0$ $n(0) = \frac{1}{4} \frac{2}{K(k)e^{2}} \frac{x(k)e^{2}}{x(k)e^{2}} \frac{1}{k}$ X(K)= & x(u) e Jwn, at w= 25K u=0 N. 2-1- [3+(2+j) + 1+(em)]=2 $\pi(K) = \frac{1}{5} \frac{1}{$ manupal out ja waitasilailtum . When m= 1. monorth illowerst it $m(\pm)_2 \perp [3 + (e+j) e^{j\pi/2} + e^{j\pi} + (2-j) e^{j3\pi/2}]$ $\chi(k) = \frac{1}{5} \left[\frac{1+2\cos(2\pi k)}{3} \right]$ $= \frac{1}{5} \left[\frac{1+2\cos(2\pi k)}{3} \right]$ $\Rightarrow aus$ when m= 2. Dox Find N- point OPT for x(m) = all ocaci m(2) 2 1 [3+ (2-y)(-1) + 1+ 4 [3+ (2-y)(-1) + 1+ $\chi(K) = \frac{N^{-1}}{E} \alpha(k) \in \overline{N} \quad K = 0, 1..$ $\frac{1}{N^{20}} \quad (N^{1-1})$ (1-10), P. - . 100 M (2-j)(-3)] 20 marth

| - AN | and the second sec | 3 · 3 · 3 · K/2 · 3 · K/2 · | $n_{3}(K) = \alpha_{1} \times_{1}(K) + MBDWRITEWEL \alpha_{2} \times_{2}(K) + Date K = 0, 1,, (N-1) - Page$ |
|-------|--|---|--|
| 3 | m(3).2 1 | [3+(2+j)(-j)=1 | proof 3- (N-2) m2 |
| H | | + (2j)(j)]21 = (4) | DFT [mg(m)] ZE Mg(m) WN uzo |
| 2 | | | K=0, 1, 00 0, (N+2) 0, 10, 10, 10, 10, 10, 10, 10, 10, 10, |
| | P, alm' | $12 \{2, 0, 0, s\} \rightarrow au = ,$ | $= \sum_{k=0}^{N-2} \left[a_1 x_1(w) + a_2 y_2(w) \right] WN,$ |
| | engo | ALLER DE PLATE | K=0, 1, (N-1) |
| H | · properties | DFT :- | $= q_{1}\chi(\kappa) + q_{2}\chi(\kappa).$ |
| | 15 Lineali | 4 | proved |
| | 2. Periodi | | Survey Change Street St |
| | 3. Churda | i ship of a Sequence | 2. Periodicity:- |
| H | | Reversal | 21m)= (1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 + 1 |
| | | as time stuff and | to zin) z N x(K) |
| | 6. Circul | an freq. stuft. (0) m | |
| | | das convolution. | then, X(K+N) = X(K) (* |
| | s. 8. Comp. | les Conjugation | The N-I WI - MK . |
| F- | | eplication of two Sequences | proof: x(K) = E - x(u). WNYK = (X) U=0 |
| - | | als theorem. tom redul | $\chi(K+N) \ge E \chi(u), WN - (K+N)$ |
| Abr 1 | 11. Symme | netric property. | $\chi(R+N) \ge \varepsilon \chi(n), WN - (R+N)$ |
| T | | 1/1 (3 (1-1) + 8] + c(+). | (() () () () () () () () () (|
| | 10 Lineaut | | WE E ACH) · WN · WN |
| - b | Enger St | N N-1 NK, | Elvin Longe 711-100 |
| | a a cu | DFT N= X(K) = E de(u). AN N=0 | Have Way Mm = (e -) -) - (A) |
| | K=0, 1 | 1,, N-1 - 0 3 | = (e-j2n)n. = (1)n= |
| | | When me 2. | Ned nk |
| | s(o(n) x | > X2(K) = E x2(n) WM | N== X(K+N) = E a(u). WN = XU N=0 |
| | P¢ T1 | + X2(K) = E x2(N) W/M T (1-) (p=s) + E 1 = (colm | 120 D 2 0 0 0 |
| | | · · · · · · · · · · · · · · · · · · · | $(k) \ge \leq o(k) \in \overline{M} \times K = 0, 1$ |
| - | -then, | 0 = [(2-)(j-2) | |
| | | | (1-1) |
| | | | |

| 3. licular shift of a Sequence 3- | xcm)= x(N+n-K) WII DWRITEWELL |
|---|--|
| In pet me cannot combine | |
| tenear strifted seq, with the | $= 2p((n-x)) \frac{\text{Date}}{\text{Page}}$ |
| original one due to loss | |
| of egnal he the period. | Epo K=1 N=4 then. |
| P | |
| So we do perodic shifting, | $\chi_{c(n)} = \chi((N+M-K))$ $m_{c}(0) = \chi_{-}(4+0-1) = \chi(3)$ |
| | |
| - XIC- W. (CH-H1) x M. E. | $m_{c(1)} = n(4+1-1) = n(4)$ |
| I I I I I I I I I I I I I I I I I I I | $m_{c}(2) > m(4+2-1) > m(2)$ |
| | $(n_{C}(3) = n_{1}(\mu_{+}3-2) = n(2)$ |
| -4-1-1 0 2 2 3 4 5 6 7 4 | Mc(3) = n(4+3-1) = n(2) 4. Jime Revaral:- |
| | no vine ilevanaro |
| In periodic shifting - sequences | HALVAIN) ~ H × KIK) |
| lean be (1234) (4123) | then, |
| (3412) (2341) (1234) | $\chi(1-y)) \rightarrow \frac{N}{0FT} \chi(1-k))_{N}$ |
| (H-CH-H) 1 - C-CH-S | Re-relation (120 = [(a-min Tat |
| 1. 1. 1. 1. 1. 1. (m-K) | $p((N-H)) \rightarrow \frac{H}{PT} \rightarrow \chi (H-K),$ |
| | DPT 1-11 |
| mischander the periodic 1 = | Doool :- DETT 2((-w)) T = E 2((-w)). |
| shift shifting in | $ \begin{array}{c} p_{200} & \vdots & DFT \left[\mathcal{X}((-n)) \right] = \mathcal{E} \left[\mathcal{X}((-n)) \right] \\ = & U_{00} \\ \end{array} $ |
| - 1-1-143 | K=0,1,0 (NI-1) -NA |
| K= no. of positione (shifted shifting | Had Had Hell Man |
| 1-min 1 / periode | $\chi((-n)) = \chi(n-n)$ |
| le no(0) = xp(0-1) = 4 | HOO J-MAN J-MAN J-MAN |
| o(c, (1)) = o(1-1) = 1 | hoo J-Mas |
| nc(2) = np(2-1) = 2 | 1×20,1,00. (N-2) |
| when Marts, ware 2 - 201 (Stoll) = Burn | ald inthe atter store as a |
| MD. Apr - | Let Nonet. Linet |
| The second se | DET[x(1-n))N] = Ex(1+).WN |
| ac (m) = adp (n=k)= n((1-M3)x | $DFT[\gamma((l-n)) N] = E \gamma(lt) \cdot WN$ $= E \gamma(lt) \cdot WN$ $= E \gamma(lt) \cdot WN$ $= K + M = M$ |
| = x((n-k)) - ww(mx) d- ((1-x)) y | = E mitt) . Why the |
| WW (WhO do (181) y a | t=n |
| another way of representing | DFT [M(C-N))] = (\$ MH) Wh |
| periodic strifting. | havene batt |
| Nº periodicity. | |
| | |

| 4 . 4 | | | |
|--------|--|--|--|
| Q. | NOT T | ((-n))N] = = mit WN -tk | 6. Circular freq. suit to WRITEWELL |
| YR | DEILO | ten ten | |
| | (marine) | 4 | $x_{k} \rightarrow x(k)$ Date Page then, |
| | 2 | 1 -tk Emilt) WIN E=N | |
| y a | 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1 | ton were brief . | MIND WN - IN (IK-W) |
| 1 | MINH | ETH (N-K)E E M(E) WIN | in hating not Ma charger 1 |
| 2 | | ((+=+++)) K== (MSX | porof state interior at |
| Q | -0 | $\chi(N-K) = \chi((-K))_{N}$ | $1 \text{ DFT } [\chi([K-2)]_M] =$ |
| -0- | 2.15 | MI S (ILLEPATE S (L)OT | 200 |
| 4 | | are time shift 3- | 1 & X ((K-L)) W WM MK. |
| | <u> </u> | | N K20 |
| - | | N X(K) | |
| | -A(T) | DFT X(K) | × ((R-2)) = × (N+K-2) |
| | then, | | and the second second second |
| 2 | with a | $-L)) \leftarrow N \rightarrow WN X(K)$ | IDET [X(IK-L))]= 1 & X(N+K) N KZO M |
| 5 | x(i.~ | DET | (ESIN) (HEES) NKZO MA |
| | proof is - | Dr - man (lend) a | pup N++K-W=E =] (1115) |
| U | | | 211-2-1 (++- |
| -9- | | (m-L)] = DFT[$m(N+m-L)$] N=1 | IDFT TX ((K-W)) = 1 & XIt). WA |
| | - | ×-1 2(N+n-L)WN | |
| nu ~~ | | Theo (14-1) x Jost - Jost | = 1 C n(t), N/N, M/N, W/N |
| hi | | 0, 1, (N-4), | $= \underbrace{1}_{N} \underbrace{1}_{N}$ |
| - + | | | |
| | | ven -l=t | IDET X((K-E))N = WA-LDI & XH |
| Alba | | I (N-MINEN-L-H (IN-1)) | $\frac{2N-1-1}{N}$ $\frac{1}{N} = \frac{1}{N} \left[\frac{1}{N} \left(\frac{1}{N} - \frac{1}{N} \right) \right] = \frac{1}{N} 1$ |
| C G | DETTO | (n-L)), = = = mit). Way | |
| | | (m-L))N = = E mit). WIN toN-L | == (Whighalm) (1), 10 |
| - 1 | | | ac(2) = 2p(2-1) = 2 |
| - | 2N=t- 2 \$ | nit) WN . WN . WA | now faking opto ou both sides |
| | tz N-l | | we get - |
| Lev ~ | ta la . International . | | |
| er | = 21 | $\frac{1}{2} = \frac{1}{2} = \frac{1}$ | X ((M-E))N = DET [WIN= MXM) } |
| U TU | t | NA MAL (MAR 2 = | (IN-M) DOMESTIC |
| | | | onthouserpar to prov mentions |
| - | | Had proved | |
| 7 2 10 | | shad proved | proved slip fills alborn |
| 21 | | | Ma periodicity. |
| | | | |

| Yo Curcular Convolution 1: - 15 | $ \stackrel{\circ}{\sim} n_3(n) = \underline{L} \stackrel{(N-3)}{\leq} \underline{\text{MBD}} \text{ WRITEWELL} $ |
|--|--|
| and the state water of the state of the stat | N WILLIEWELL |
| of x(m) ~ Xx(K) | (N^{*1}) +mk Hage (N^{*1}) (N^{*1}) |
| pet pet | $(N \cdot i) = 1 \leq \text{MBLUWRITEWELL}$ $N = 1 \leq \text{MBLUWRITEWELL}$ $N = 0 \text{ Date}$ $M = 0 Dat$ |
| $n_2(n) \rightarrow N_2(K)$ | I MOO - LLO - MK |
| DFT | • WN |
| and X3(K) = M2(K)+2(K) | |
| then , I MIT I I I I I I I I I I I I I I I I I | $= 1 \mathcal{E} \alpha_{1}(m) \mathcal{E} m_{2}(k)$ |
| | N M20 120 |
| $\pi_{3}(n) = \pi_{1}(n) \odot \pi_{2}(n)$ | E WN (m+2-1)K |
| | |
| charlas convolution is also eff | (Nort) (mol-n)k |
| periodic convolution. having | KOS & W.N. |
| lengter equal to length of | V 420 |
| convolved, sequences; | suppose WN (Met-n) =a. |
| | - Dead |
| PLOOPS- Mach) = IDFT [X3(K)] | $e \in a^{k} = \frac{1-a^{k}}{1-a} \text{when } a \neq 1$ |
| | Levo M Contra |
| $P(a(m)) = 1$ $(N-1)$ $(m) = -\pi K$ | |
| $\frac{N-1}{N} = \frac{N-1}{\xi} \times_{3}(k) = \frac{\pi k}{N}$ | Here mue see that on |
| = m= 0, 1, | |
| | constdering & a = 1-a, k=0 1-a, |
| Smee . | |
| $X B(K) = A_1(K) \cdot X_2(K)$ | then eq. (becomes zero. |
| (N-2) 1-14 -NK | to me will consider this some |
| *. ng(m) = 1; E * x1(k) · x2(k) · WN N K=0 - 0 | mept case. Te gak= N., (a21) |
| N K=0 | K=0 setuldet 4 |
| let (1-M) 10CN | - their Churchan array |
| let $(1-M)$ $(1-M)$ MK . (N-2) MK . $M_{2}(K) = E \mathcal{H}_{2}(M)$. MN M_{20} $-M$ | inediation (m+l-n) = + + + + + + + + + + + + + + + + + + |
| M20 -0 | 1 - (W(m+k+n)) |
| MARSOFER. SIN-DOM | Sistem + |
| Contract of the second s | for existance of circular com. |
| $\frac{(N-4)}{\sqrt{2}(K)} \neq m_2(2) W_N \qquad (M)$ | |
| L=0 | e W N (m+l-n) = 1 |
| 014= 011397= + 57 ENDER = (E)01 | Trend |
| | when, |
| now substituting the -values | m+l-u = 2N |
| | $M_3(n) = 1$ G mLOM) G m2(L). N N M20 L_{20} m2. M_{21} |
| from eq. (D. C. (m) with eq. (). | $M_3(n) = 1 \leq mLOM) \leq m_2(L)$. N |
| | net-N-q |
| | |

| R | $n_3(n) =$ | M = 1 $E = \pi_1(m) = \pi_2(L)$ M = 0 L = 0 | By | Ja | bula | - Me | ting | BDW | RITEWEL |
|--------|-------------|--|---------|-------|--------------|---------|-------------|------------|------------|
| | Francis La | China Top Toland and I have been been been been been been been be | ran | ige (| LICH | -1) -1) | | ate age | |
| h | mtl-h | = 9 N | | (3 |) <u>-</u> K | | | alex | |
| Ł | L = 0 | ln+n-m | - | | | 1.24 | | | |
| | - | | 0× | +3 | -2 | -1 | 0 | 104 | 2 3 |
| 9 | L = | ((n-m)),, | Ma(n) | | 511 | 1 | 1 | 2 | 2 |
| a- | | 0 - MI M | 1.01 | at a | E Car | | I | (m) | 10 1 |
| | m3(m)= | E nath). n2 ((n-m))N. | sin) | | | 1 | 2, | 1 | 1 1 |
| | | M20 (encular cour.) | 61 | ala | 13 | | t. Jak | tow | 10 ton |
| | N20,1 | Los & William | nop(n) | 1 | 1 | V | 2, | | -1 Lan |
| Ŧ | | - BOF M | 1 | Have | 137 | 2 | | 0.0 | |
| | mating | 20 N±(K).m2. (m−K). | mpin | 2 | 1 | 2.00 | 2 | 2 | 1 |
| | | K=-00 | | 1 | - | - | 1 | | Aler |
| | When at 2 | milu) (Dro(n)) | n2(1-n) | ner | 2 | 11 | (1 | e 12 | -2- |
| | きこめ | (lenear cour). | | | 4 | 1 | | | - |
| | | and the second states of f | A2/2-1 | 5-1 | 643 | 22 | 1 | 1 2- | 2 |
| 4- | M3 [. | n) + nsing (n x 2(n) | | 1/_ | 1.00 | 100 | - N | M | 1 |
| | MD- | | mg(3-5) | | C | -111 | 2 | 11 | 6 9100 |
| | .A. | ploved | | | | | | 1 | |
| | 10 | Home eq. (Corrower 20 | | CND | Kalue | ALK. | - (A | Jex | 1 |
| 1 | Methods | of Miculae Convolution 3- | - | | Mad | (1 | -(4) | | - |
| | (1=R), .M | Acet cater to g and | 19303 | 11= | 金. | nim | 2 712 | (n=m) | Mak |
| Also a | + Jablula | 4-4- | | 0 | m 70 | 0 | -X / | 4 | tin a |
| 2 | + Using | Circular array. | n | 20, | 1, | . (M | -1) | | a. |
| | + using | DET & IDET (Ustochhanis | . 8 | into | 1 .Con | ine . | 3= | 8128 | |
| 1 | 0 | (Method) - | me | 0- | - | 05 | NN | 100 | |
| | -> Matix | | E | m3(| n) == | 12. | nin | Jar el m | (-m)N. |
| T. | , uno | for existances of sinular | 6 | _ | | PK 2 00 | (1- | w1 | |
| | Qo Determi | $\frac{1}{12} = \frac{1}{12} \frac{1}{12}$ | (ii)? | 360) | zul | 12-1-2 | 2 7 2 - 4 3 | 2×1×1 | 25 IN |
| | 2 | te why make st. | 1 | 3.1 | all of | 19.94 | 0 | -1 | E. La |
| 1 | Malm |) = {2,11,1,2} model | no | (1) | = 101 | + 27 | 12+ | 2721 | 1/21 -= 10 |
| | , | MB = N-14M | | 21 | | + | 4 | 120 | |
| E. | | tott balt | | | | | | | 1 × 2 = 9 |
| | H. Callette | R (MOLIN S 1 = (m) par | | 0. | 0 00 | tim | (m) . | ġ @ ., | a with |
| | is some in | orl ort M | 23(| m) = | 1424 | 2714 | - 2 * 1 + | -172. | 2.8, |
| 1 32 | | | | | | | | | |

$$\frac{1}{2} = \frac{1}{2} = \frac{1}$$

| - | 1 | | |
|----------|-------------------------|--|---|
| ail | (0) 911(1) 912(2) | $\begin{bmatrix} 1 & 1 & 2 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \end{bmatrix} \begin{bmatrix} 1 & -j \\ 2 & -1 \\ 2 & -1 \end{bmatrix}$ | $\begin{bmatrix} n_3(0) \\ n_3(1) \\ n_3(2) \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \begin{bmatrix}$ |
| 4 | _ M1(3) _ | 1 3 -1 - 1 1 1 | $\left[n_{3}(3) \right] \left[1 - j - 1 j \right] \left[2j \right]$ |
| ł. | - (m-) - | Mars Ant | { 1, 5, 5, 2 } = (m) p |
| | A LAL ALX | a casar | |
| 2. | m2lo) | 2 2 2 2 2 7 2 | $m_3(m) = \{ 9, 10, 9, 8 \}$ |
| | m2(1) | 2 1 1 -1 1 | |
| | m2(2) | 1 - 1 - 1 | seined sub- |
| | m2 (3) | 1 1 -1 - 1 - 2 - 1 | By Matein Method 3- |
| | البدة جرا | mater material a final | |
| 7 | | Contact Je | Caller |
| | milo) = 1 | +2+2+1 = 6 | My(m)> { 1, 2, 2, 1} |
| | $\chi_1(t) =$ | 1-21-2 +1-3-1-3-1 | L Brethe a |
| | X1(2) 2 | V-\$1+/2-1 = 7-1-10 | M2(n) 2 2 2, 1, 1, 2 3 |
| 1 E | X = (3) = | 2+j-1-2j 2 1-j | F F CECALIN IT Y |
| 4 | ويتشره | had minit & + (+) on + (E) or | m3(0) 7 1 1 2 2 2 2 |
| - i | ¥210)= | 6 x2(1) - 1+j | m3(1) 2 2 1 1 2 0 1 |
| | × 2(3) = | · 0 y2(3) =t-j | ma(2) - 2 2 1 1 1 |
| | | | m(3) 1 1 2 2 1 2 |
| | ×2(K) = | 26, (-1-j), 0, (++j)子 | wight In seq. att see |
| 1 | S. Sector | 8 (E, O) & f = (re)alc , to | |
| | ×2(K) | 2 5 6 · (1+j) · 0 , (1-j)] | mg(n) = 2 9, 20, 9, 8 子 |
| aba un | be | By Using DET & IDET MAN | Moles De Cautillacenie) |
| - I amon | | Marine Marine D | |
| | 00 ×3[] | ()= {36,-ej,0,2j}. | Oo. Determine () m(n) = 32.1,2 |
| 1 | | (ALT & LALE = KILK) + TICK) | |
| - Andrew | T | T | $M_2(n) = \{1, 2, 3, 4\},$ |
| an | m3(0) 7 (| 1 1 1 1) 1 = (m) 1 BG | er (e):m |
| | M3(c) 2 | 1 W_{4} W_{4} W_{4} W_{4} $-2j$ | aus - 1914, 16, 14, 165 |
| | mg(2) 4 | $1 W_{\mu}^{2} W_{\mu}^{4} W_{\mu}^{5} = 0 0 0 0 0 0 0 0 0$ | re= |
| Bin | m3(3) | | Sequence . |
| | | ₹ 3, 1, 1, 1 = 5 = (m) = m | s (- cost) - s |
| | | <u> </u> | |
| | | | p. I |
| in l | - | | |
| | | | |

Climbor array. Matrix Method . MBD WRITEWELL $M_{D}(m) = \begin{bmatrix} 2 \\ 1 \\ 2 \end{bmatrix} \begin{bmatrix} Date \\ Page \\ 1 \\ 2 \end{bmatrix}$ d1(n)= { 2, 1, 2, 1} n.(n)= 2 1,2,314 3 $\frac{1}{2}$ $\frac{1}$ msin) = - { 14, 16, 14, 16 } / / / / / 8. Comptex Conjugate Property 3-The MIN DET X(K) then $n^{*}(n) \xrightarrow{N} x^{*}((-\kappa))$ DET $= x^{*}(N-\kappa)$ proof = DFT[m(n)] = EmployedK = 0, 1, ..., (N-1), K = 0, 1, ..., (N-1), N = 0malo 1= Emotion) mal-m) = $\frac{k_{\text{F}}\left(1,1\right)}{\text{DFT}\left[m^{\text{T}}\left(n\right)\right]} = \frac{m^{-1}}{\sum_{k=0}^{N-1}} \frac{m^{k}}{m^{k}} \frac{m^{k}}{m^{k}}$ = 2+6+4+2=14 $n_0(1)=2$ Emal(m) $n_2(1-m)$ = + 8+3+4=16. barrong = E nt(n) WN (N-K)n. [N=0 (mulliplying. IxIN = 1) no(2) = En((m) m2 (2-m) = 6+4+2+2 = 14 en allementeres Page Star $m_3(g) = Eq(m) m_2(3-m)$ DFT $[n^{\#}(n)] = \sum_{k=0}^{\infty} n^{\#}(n) W_N W_N$ 1012 4+3+8+1 = 16rin sequence and. In represented $= \sum_{n=0}^{N-1} \sum_{n=0}^{N-1$ = mg (m) = {14,11,14,16}- 10 (min) = s(e(n)+(x -in) = x × (N-K) CE-143 2 11 30