FFT by decimation in frequency for 8 point sequence

$$x[n] = \begin{cases} 1 & 0 \le n \le 7 \\ 0 & \text{otherwise} \end{cases}$$

Compute the 8point DFT by using DIFFFT of this sequence

Sol: step 1 :-

$x(0) = 1$ $\quad x(4) = 1$

$x(1) = 1$ $\quad x(5) = 1$

$x(2) = 1$ $\quad x(6) = 1$

$x(3) = 1$ $\quad x(7) = 1$

step 2 :-

$W_N^k = e^{-j(\frac{2\pi}{N})k}$ $\quad N=8$, $k = 4 = 0, 1, 2, 3$

If $k=0$

$W_8^0 = e^{-j(\frac{2\pi}{8})0} = e^0 = 1$

$k=1$

$W_8^1 = e^{-j(\frac{2\pi}{8})1} = e^{-j(\pi/4)} = \cos\pi/4 - j\sin(\pi/4)$

$= 0.707 - j0.707$

$k=2$

$W_8^2 = e^{-j(\frac{2\pi}{8})2} = e^{-j(\pi/2)}$

$= \cos(\pi/2) - j\sin(\pi/2)$

$\Rightarrow -j$

$k=3$

$W_8^3 = e^{-j(\frac{2\pi}{8})3} = e^{-j(3\pi/4)}$

$= \cos(3\pi/4) - j\sin(3\pi/4)$

$= -0.707 - j0.707$

Butterfly diagram decimation in frequency -for 8 point sequence