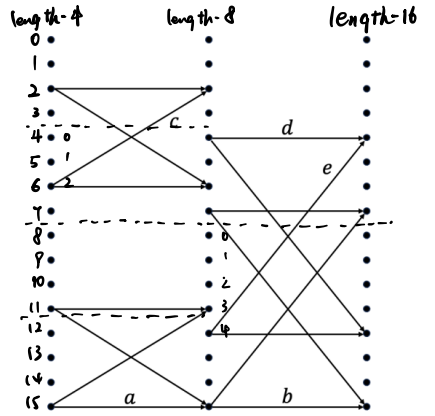
[1].



$a = -W_8^3 = -e^{-j\cdot\frac{2\pi\cdot3}{8}} = -e^{-j\cdot\frac{3}{4}\pi}$

$b = -W_{16}^7 = -e^{-j\cdot\frac{2\pi\cdot7}{16}} = -e^{-j\cdot\frac{7}{8}\pi}$

$c = W_8^2 = e^{-j\cdot\frac{2\pi\cdot2}{8}} = e^{-j\cdot\frac{\pi}{2}}$

$d = 1$

$e = W_{16}^4 = e^{-j\cdot\frac{2\pi\cdot4}{16}} = e^{-j\frac{\pi}{2}}$

[2] $x[n] = \{\underset{\uparrow}{1}, 4, -2, 0, 3, -1\}$ $\quad h[n] = \{\underset{\uparrow}{1}, 0, -1\}$

(a) $x[n] * h[n]$

$$= \begin{bmatrix} 1 & & & & & \\ 0 & 1 & & & & \\ -1 & 0 & 1 & & & \\ & -1 & 0 & 1 & & \\ & & -1 & 0 & 1 & \\ & & & -1 & 0 & 1 \\ & & & & -1 & 0 \\ & & & & & -1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 4 \\ -2 \\ 0 \\ 3 \\ -1 \end{bmatrix} = \begin{bmatrix} 1 \\ 4 \\ -3 \\ -4 \\ 5 \\ -1 \\ -3 \\ 1 \end{bmatrix} = \{\underset{\uparrow}{1}, 4, -3, -4, 5, -1, -3, 1\}$$

(b) $x[n] \circledast h[n]$

$$= \begin{matrix} & 1 & 4 & -2 & 0 & 3 & -1 \end{matrix}$$
$$\begin{bmatrix} 1 & 0 & 0 & 0 & -1 & 0 \\ 0 & 1 & 0 & 0 & 0 & -1 \\ -1 & 0 & 1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 0 & 1 & 0 \\ 0 & 0 & 0 & -1 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 4 \\ -2 \\ 0 \\ 3 \\ -1 \end{bmatrix} = \begin{bmatrix} -2 \\ 5 \\ -3 \\ -4 \\ 5 \\ -1 \end{bmatrix} = \{\underset{\uparrow}{-2}, 5, -3, -4, 5, -1\}$$

(c) in order to $x[n] \circledast_N h[n] = x[n] * h[n]$,

$N \geq \text{length}(x[n]) + \text{length}(h[n]) - 1$

$= 6+3-1 = 8$

So minimum N: 8

[3].

(a) $x[n]$: zero padding 14 zeros

$h[n]$: zero padding 56 zeros

(b) $N = 57+15-1 = 71$, the min 2's power is 128

$x[n]$: zero padding $128-57 = 71$ zeros

$h[n]$: zero padding $128-15 = 113$ zeros

(c) yes. we can, consider $N=71$:

$\hat{x}[n]$ zero padding 14 zeros at the beginning

$\hat{h}[n]$ zero padding 56 zeros at the beginning

$x[n] * h[n] = DFT^{-1}\{DFT\{x[n]\} \cdot DFT\{h[n]\}$

$\hat{X}[k] = e^{j\frac{2\pi\cdot14k}{N}} X[k]$

$\hat{H}[k] = e^{j\frac{2\pi\cdot56k}{N}} h[k]$

So $x[n] * h[n] = DFT^{-1}\{e^{j\frac{2\pi k}{71}} DFT\{\hat{x}[n]\} \cdot DFT\{\hat{h}[n]\}$