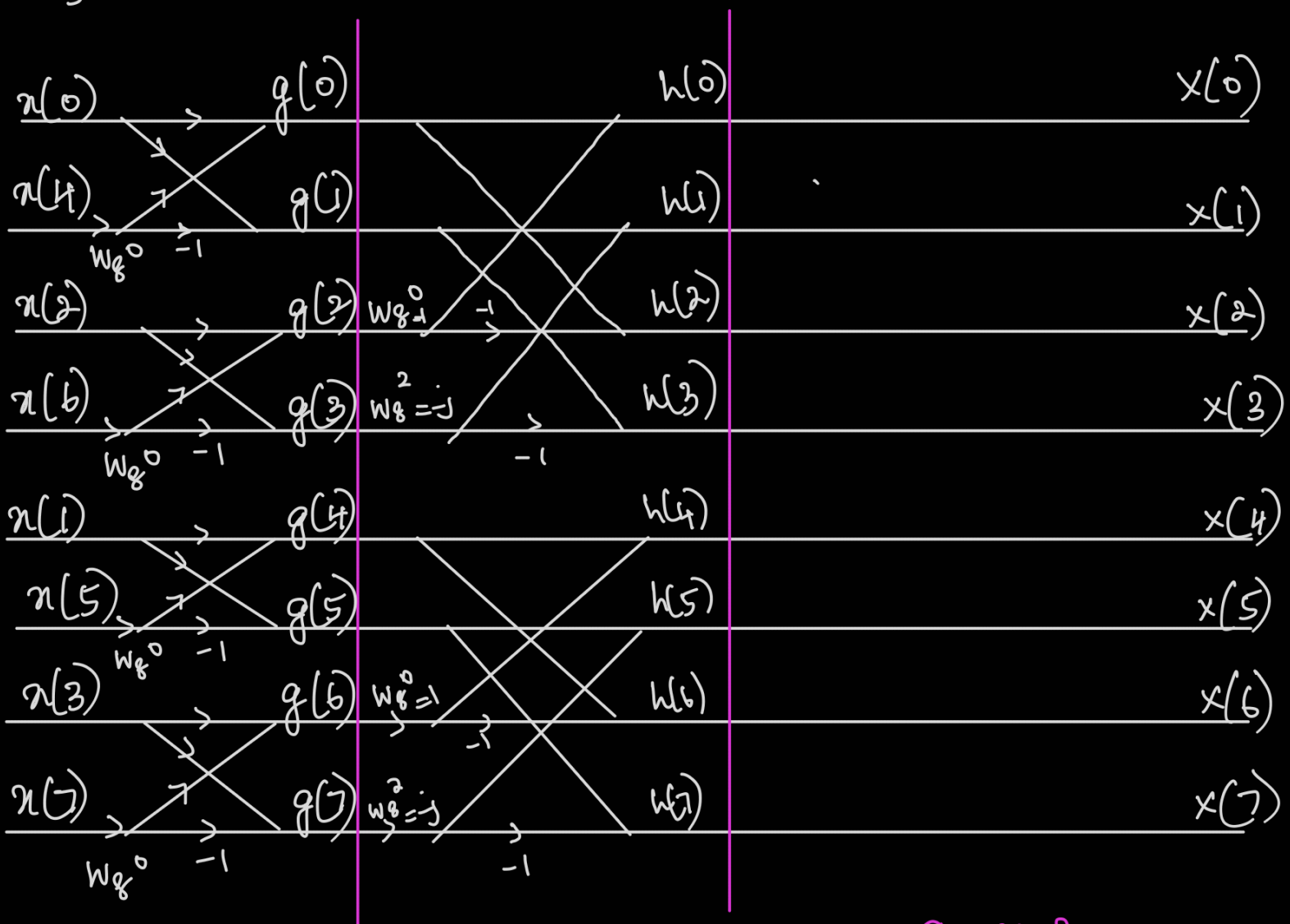
Example i/p

$x_0 = 0.0 + j\,0.0$
$x_1 = 1.0 + j\,0.0$
$x_2 = 2.0 + j\,0.0$
$x_3 = 3.0 + j\,0.0$
$x_4 = 4.0 + j\,0.0$
$x_5 = 5.0 + j\,0.0$
$x_6 = 6.0 + j\,0.0$
$x_7 = 7.0 + j\,0.0$



Stage 0 | g | Stage 1 | h | Stage 2

$$W_N^n = \left(e^{\frac{-j2\pi}{N}}\right)^n \quad ; \quad W_8 = e^{\frac{-j2\pi n}{8}} = e^{\frac{-jn\pi}{4}}$$

g → o/p of stage 0 calculations

h → o/p of stage 1 calculations

Stage 1 Calculations :

$g(0) = x(0) + x(4) = (0.0+j0.0) + (4.0+j0.0) = 4.0+j0.0$

$g(1) = x(0) - x(4) = (0.0+j0.0) - (4.0+j0.0) = -4.0+j0.0$

$g(2) = x(2)+x(6) = (2.0+j0.0) + (6.0+j0.0) = 8.0+j0.0$

$g(3) = x(2) - x(6) = (2.0+j0.0) - (6.0+j0.0) = -4.0+j0.0$

$g(4) = x(1)+x(5) = (1.0+j0.0) + (5.0+j0.0) = 6.0+j0.0$

$g(5) = x(1)-x(5) = (1.0+j0.0) - (5.0+j0.0) = -4.0+j0.0$

$g(6) = x(3)+x(7) = (3.0+j0.0) + (7.0+j0.0) = 10.0+j0.0$

$g(7) = x(3) - x(7) = (3.0+j0.0) - (7.0+j0.0) = -4.0+j0.0$

$x(0)$
↳ in0_real [15:0] , in0_imag [15:0]

$x(4)$
↳ in4_real [15:0], in4_imag [15:0]

$g(0) = x(0) + x(4)$

g0_real [15:0] = in0_real [15:0] + in4_real [15:0]

g0_imag [15:0] = in0_imag [15:0] + in4_imag [15:0]

Stage 2 Calculations :

$$h(0) = g(0) + g(2)$$
$$h(1) = g(1) - j\,g(3)$$
$$h(2) = g(0) - g(3)$$
$$h(3) = g(1) + j\,g(3)$$
$$h(4) = g(4) + g(6)$$
$$h(5) = g(5) - j\,g(7)$$
$$h(6) = g(4) - g(6)$$
$$h(7) = g(5) + j\,g(7)$$

$$h(0) = g(0) + g(2)$$
$$= (4.0 + j\,0.0) + (8.0 + j\,0.0)$$

$$\boxed{h(0) = 12.0 + j\,0.0}$$

$$h(1) = g(1) - j\,g(3) = g(1) - g'(3)$$

$$g'(3) = j\,g(3) = j(g(3)\_real + j\,g(3)\_imag)$$
$$= j\,g(3)\_real - g(3)\_imag$$

$$g'(3) = -g(3)\_imag + j\,g(3)\_real$$

$$\Rightarrow \boxed{\begin{aligned} g'(3)\_real &= -g(3)\_imag \\ g'(3)\_imag &= g(3)\_real \end{aligned}}$$

$$h(1) = (-4+j0.0) - j(-4+j0.0)$$

$$= -4+j0.0 + j4 + 0.0$$

$$\boxed{h(1) = -4+j4}$$

$$h(2) = g(0) - g(2) = (4.0+j0.0) - (8.0+j0.0) = -4.0+j0.0$$

$$h(3) = g(1) + j\,g(3) = g(1) + g'(3)$$

$$g'(3) = j\,(g(3)\_real + j\,g(3)\_imag)$$

$$= -g(3)\_imag + j\,g(3)\_real$$

$$\Rightarrow \boxed{\begin{aligned} g'(3)\_real &= -g(3)\_imag \\ g'(3)\_imag &= g(3)\_real \end{aligned}}$$

$$h(3) = (4.0+j0.0) + j\,(-4.0+j0.0)$$

$$= -4.0 + j0.0 - j4.0 - 0.0$$

$$\boxed{h_3 = -4.0 - j4.0}$$

$$h(4) = g(4) + g(6)$$

$$= (6+j0.0) + (10+j0.0) = 16.0 + j0.0$$

$$\boxed{h(4) = 16.0 + j0.0}$$

$h(5) =$