Step-1

Given that the first m and the last m components of the vector $y = F_n c$ are

$$\left.\begin{aligned} y_j &= y_j' + w_n^j y_j'', \ j = 0,1,\dots,m-1 \\ y_{j+m} &= y_j' - w_n^j y_j'', \ j = 0,1,\dots,m-1 \end{aligned}\right\} \quad \text{......} \ (1)$$

For $n = 2$, we have to write y_0 from the first line of equation (1) and y_1 from the second line. And also, for $n = 4$, use the first line; we have to find y_0 and y_1, and the second to find y_2 and y_3, all in terms of y' and y''.

Step-2

For $n = 2$

First line of equation (1) is $y_j = y_j' + w_2^j y_j''$, $j = 0,1,\dots,m-1$

If $j = 0$, then

$$y_0 = y_0' + w_2^0 y_0''$$

$$\Rightarrow \boxed{y_0 = y_0' + y_0''}$$

Step-3

Second line of equation (1) is $y_{j+m} = y_j' - w_2^j y_j''$, $j = 0,1,\dots,m-1$

If $j = 0, m = 1$,

$$y_{0+1} = y_0' - w_2^0 y_0''$$

$$\Rightarrow \boxed{y_1 = y_0' - y_0''}$$

Step-4

For $n = 4$

First line of equation (1) is $y_j = y_j' + w_4^j y_j''$, $j = 0,1,\dots,m-1$

If $j = 0$,

then $y_0 = y_0' + w_4^0 y_0''$

$$\Rightarrow \boxed{y_0 = y_0' + y_0''}$$

Step-5

If $j=1$,

then $y_1 = y_1' + w_4' y_1''$

$w_4 = e^{\frac{2\pi i}{4}}$

$= \cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$

$= i$

Therefore $\boxed{y_1 = y_0' + i y_0''}$

Step-6

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Second line of equation (1) is $y_{j+m} = y_j' - w_4^j y_j''$, $j = 0,1,\ldots,m-1$

If $j=0, m=2$,

then $y_{0+2} = y_0' - w_4^0 y_0''$

$\Rightarrow \boxed{y_2 = y_0' - y_0''}$

Step-7

If $j=1, m=2$,

then $y_{1+2} = y_1' - w_4' y_1''$

$\Rightarrow \boxed{y_3 = y_1' - i y_1''}$