 $n = 2^p + 1$

$$\begin{matrix} 1 & 0 & & & \\ \ell & d & u & & \\ & \ell & d & u & \\ & & \ell & d & u \\ & & & 0 & 1 \end{matrix}$$

$n = 5$

$$\begin{pmatrix} 1 & 0 & & & \\ \ell & d & u & & \\ & \ell & d & u & \\ & & \ell & d & u \\ & & & 0 & 1 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} f_0 \\ f_1 \\ f_2 \\ f_3 \\ f_4 \end{pmatrix}$$

$$\left.\begin{aligned} x_1 &= \tfrac{1}{d}(f_1 - \ell x_0 - u x_2) \\ x_3 &= \tfrac{1}{d}(f_3 - \ell x_2 - u x_4) \end{aligned}\right\} \rightarrow \ell x_1 + d x_2 + u x_3 = f_2$$

$$\Leftrightarrow \tfrac{\ell}{d}(f_1 - \ell x_0 - u x_2) + d x_2 + \tfrac{u}{d}(f_3 - \ell x_2 - u x_4) = f_2$$

$$\Leftrightarrow \underbrace{-\tfrac{\ell^2}{d}}_{\tilde{\ell}} x_0 + \underbrace{\left(d - \tfrac{\ell u}{d} - \tfrac{u\ell}{d}\right)}_{\tilde{d}} x_2 \underbrace{- \tfrac{u^2}{d}}_{\tilde{u}} x_4 = \underbrace{f_2 - \tfrac{\ell}{d} f_1 - \tfrac{u}{d} f_3}_{\tilde{f}}$$