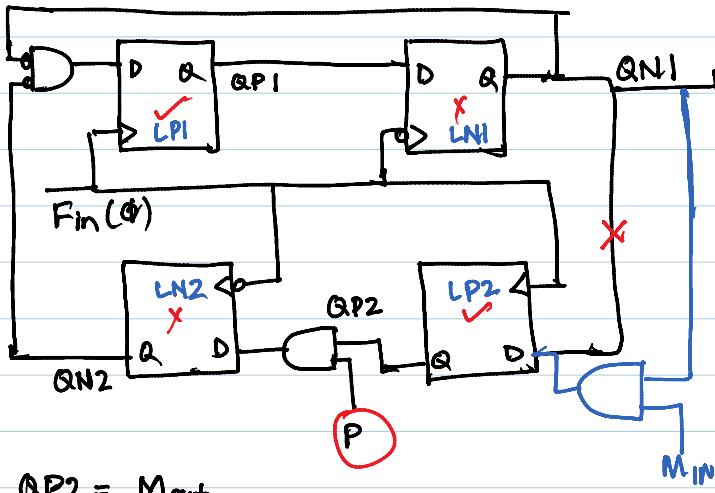


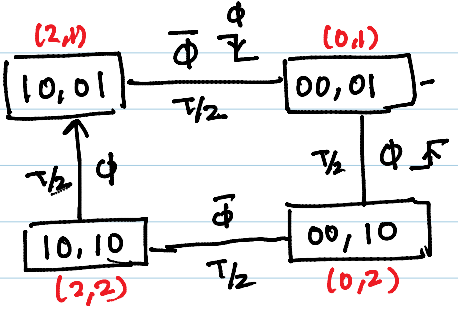
# Fractional-N PLL

Divider N/N+1

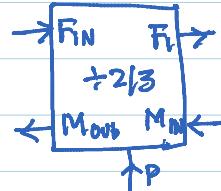
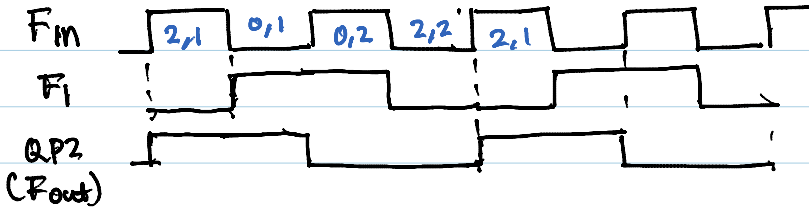


{QN1, QN2, QP1, QP2}

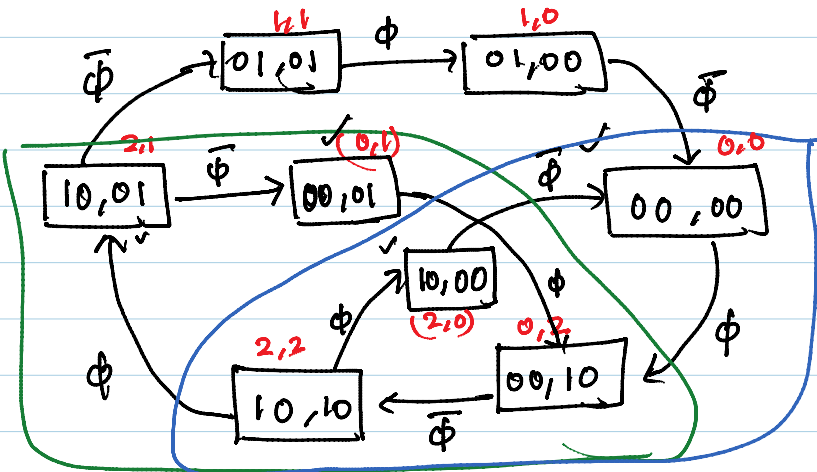
$$\begin{aligned}
 QN1^+ &= QP1 \\
 QN2^+ &= QP2 \cdot P \\
 QP1^+ &= \overline{QN1} \cdot \overline{QN2} \\
 QP2^+ &= QN1
 \end{aligned}$$



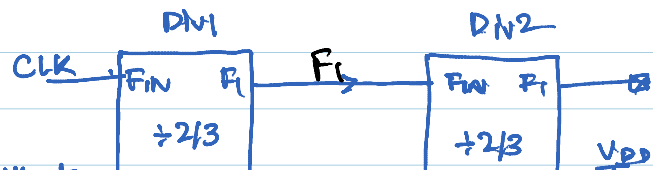
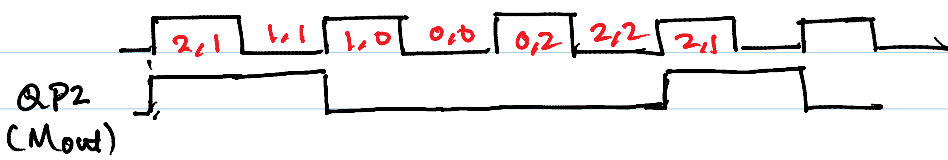
QP2 = Mout.



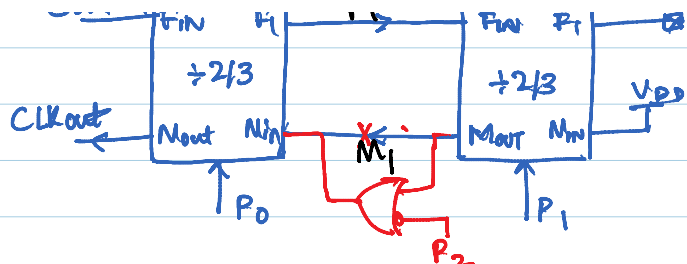
Divide-by-3 : P=1



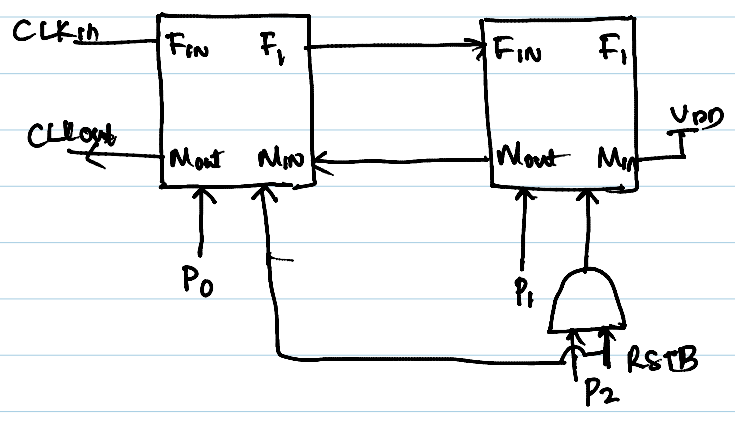
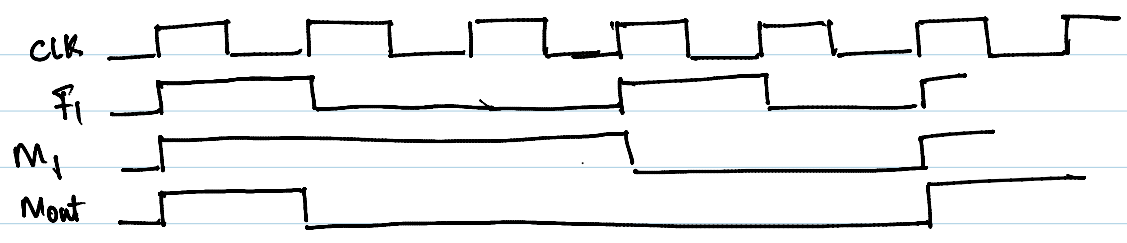
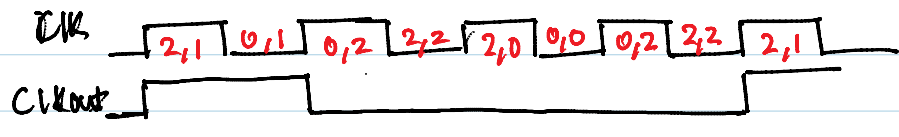
$$\begin{aligned}
 QP1^+ &= \overline{QN1} \cdot \overline{QN2} \\
 QP2^+ &= QN1 = \underline{QN1 \cdot M1N} \\
 QN1^+ &= QP1 \\
 QN2^+ &= QP2 \cdot P
 \end{aligned}$$



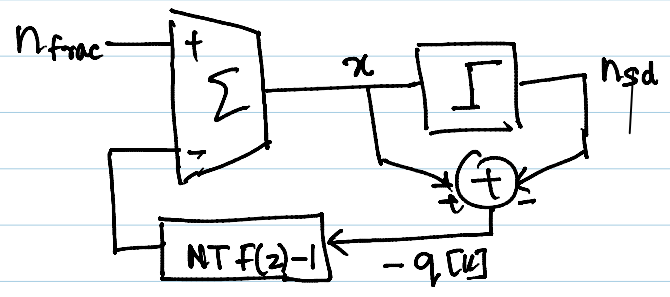
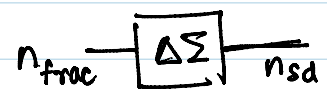
P1	P0	DN1	DN2	Div
0	0	±2	±2	±4



P <sub>1</sub>	P <sub>0</sub>	Div1	Div2	Div
0	0	÷2	÷2	÷4
0	1	÷2/3	÷2	÷5
L	0	÷2	÷3	÷6
L	1			÷7



⇒ Seamless switching across whole range



$$n_{sd}(z) = n_{frac}(z) STF(z) + q(z) NTF(z)$$

$$n_{sq}[k] = x[k] + q[k]$$

$$\Rightarrow n_{frac}(z) - (NTF(z) - 1) x - q(z) = n_{sd}(z) - q(z)$$

$$n_{sd}(z) = n_{frac}(z) + q(z) NTF(z)$$

