# Arithmetic Operations

$$y_n = y_{[n-1]} + (k * y_{[n-1]}^2 + x_{[n]}) - \left(x_{[n]}^2 - y_{[n-1]} + \frac{1}{k}\right) * \frac{1}{k}$$

**i) Sr:** $Y\text{res} <= Y_{in}$

**ii) Sd:** $X <= x_{in}$

**iii) S1:** $A_0 <= y * y$

**iv) S2:** $A_1 <= x * x \ (x_n^2)$

**v) S3:**
$A_3 <= k * A_0 + x_n$
$A_4 <= A_2 * (1/k)$
$A_5 <= Y_{res}$

**vi) Yres** $<= A_5 + A_3 - A_4$

# Finite State Machine (FSM)

reset = 1

Sr

go = 0

go = 0
busy = 1

reset = 0    Sd    go = 1    S1

go = 1
busy = 0

go = 1
busy = 0

S2

go = 0
busy = 0

go = 1
busy = 0

S3

go = 0
busy = 1

Sf

stop = 1

St

go = 1
busy = 0

S4

go = 1
busy = 0

go = 0
busy = 1