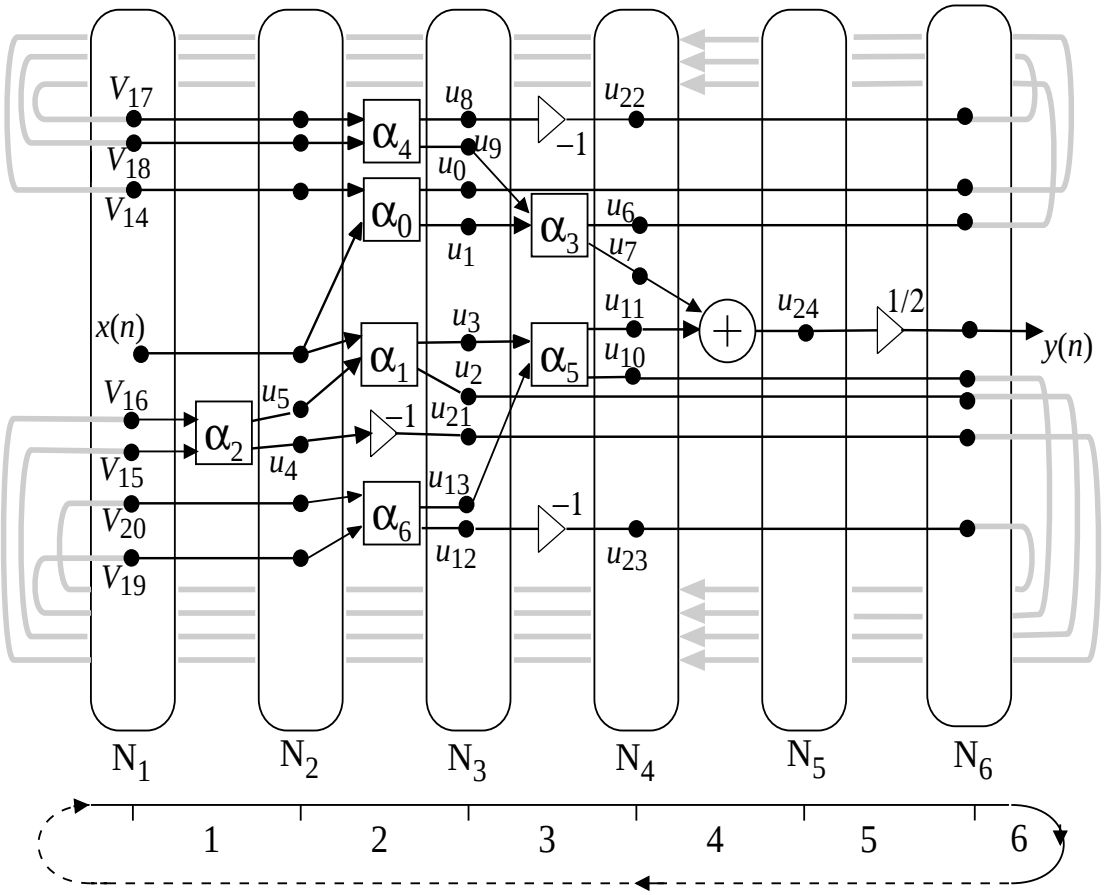
6.2 The critical path in the filter is two cascade adaptors. Derive the SFG in precedence form with adaptors as basic operators, i.e., processing elements.



Finally, we obtain the difference equations in computational order for the filter.

N_1

$V_{15}(n) = u_2(n-1)$
$V_{16}(n) = u_{21}(n-1)$

$N_1 \rightarrow N_2$ adaptor α_2

$d_2(n) = V_{15}(n) - V_{16}(n)$
$f_2(n) = \alpha_2 \cdot d_2(n)$

N_2

$u_4(n) = V_{15}(n) + f_2(n)$
$u_5(n) = V_{16}(n) + f_2(n)$
$V_{14}(n) = u_0(n-1)$
$V_{17}(n) = u_6(n-1)$
$V_{18}(n) = u_{22}(n-1)$
$V_{19}(n) = u_{10}(n-1)$
$V_{20}(n) = u_{23}(n-1)$

$N_2 \rightarrow N_3$ adaptor α_0

$d_0(n) = x(n) - V_{14}(n)$
$f_0(n) = \alpha_0 \cdot d_0(n)$

$N_2 \rightarrow N_3$ adaptor α_0

$d_1(n) = x(n) - u_5(n)$
$f_1(n) = \alpha_1 \cdot d_1(n)$

$N_2 \rightarrow N_3$ adaptor α_0

$d_4(n) = V_{17}(n) - V_{18}(n)$
$f_4(n) = \alpha_4 \cdot d_4(n)$

N_2 -> N_3 adaptor α_0

$d_6(n) = V_{19}(n) - V_{20}(n)$

$f_4(n) = \alpha_6 \cdot d_6(n)$

N_3

$u_0(n) = x(n) + f_0(n)$

$u_1(n) = V_{14}(n) + f_0(n)$

$u_2(n) = x(n-1) + f_1(n)$

$u_3(n) = u_5(n-1) + f_1(n)$

$u_8(n) = V_{17}(n-1) + f_4(n)$

$u_9(n) = V_{18}(n-1) + f_4(n)$

$u_{12}(n) = V_{19}(n-1) + f_6(n)$

$u_{13}(n) = V_{20}(n-1) + f_6(n)$

$u_{21}(n) = -1 \cdot V_4$

N_3 -> N_4 adaptor α_3

$d_3(n) = u_1(n) - u_9(n)$

$f_3(n) = \alpha_3 \cdot d_3(n)$

N_3 -> N_5 adaptor α_5

$d_5(n) = u_3(n) - u_{13}(n)$

$f_1(n) = \alpha_5 \cdot d_5(n)$

N_4

$u_6(n) = u_1(n) + f_3(n)$

$u_7(n) = u_9(n) + f_3(n)$

$u_{10}(n) = u_3(n-1) + f_5(n)$

$u_{11}(n) = u_{13}(n-1) + f_5(n)$

$u_{22}(n) = -1 \cdot u_8$

$u_{23}(n) = -1 \cdot u_{12}$

N_5

$y_0(n) = u_7(n) - u_{11}(n)$

$y(n) = (1/2) \cdot y_0(n)$