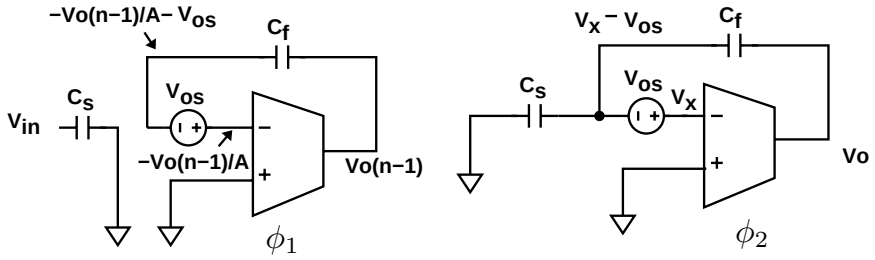

$$V_x = V_o/(-A),\ (V_o - (V_x - V_{os}))C_f + (0 - (V_x - V_{os}))C_s$$

$$= V_{in}Cs + (V_o(n-1) + \frac{V_o(n-1)}{A} + V_{os})C_f$$

$$V_o = V_{in}\frac{C_s}{C_f} - \frac{V_o}{A} - V_{os} - (\frac{V_o}{A} + V_{os})\frac{C_s}{C_f} + V_o(n-1) + \frac{V_o(n-1)}{A} + V_{os}$$

$$V_o(1 + \frac{1}{A} + \frac{1}{A}\frac{Cs}{C_f}) = V_{in}\frac{C_s}{C_f} - V_{os}\frac{C_s}{C_f} + V_o(n-1)(1 + \frac{1}{A}),\ \beta = \frac{C_f}{C_s + C_f}$$

$$V_o = V_{in}\frac{C_s}{C_f}\frac{1}{1 + \frac{1}{A\beta}} - V_{os}\frac{C_s}{C_f}\frac{1}{1 + \frac{1}{A\beta}} + V_o(n-1)(1 + \frac{1}{A})\frac{1}{1 + \frac{1}{A\beta}}$$

$$\frac{1}{A\beta} = \mu(1+k),\ \mu = 1/A, k = \frac{C_s}{C_f}$$

$$V_o(n) = V_{in}(n-1)\frac{k}{1+\mu(1+k)} - V_{os}\frac{k}{1+\mu(1+k)} + V_o(n-1)\frac{1+\mu}{1+\mu(1+k)}$$

$$V_o(n) \approx V_{in}(n-1)k(1-(1+k)\mu) - V_{os}\frac{k}{1+\mu(1+k)} + (1-k\mu)V_o(n-1)$$

$$V_{os} = 0,\ V_o(n)(1+\mu(1+k)) = V_{in}(n-1)k + V_o(n-1)(1+\mu)$$

$$H(z) = \frac{V_o}{V_{in}} = \frac{kz^{-1}}{1+\mu(1+k)-(1+\mu)z^{-1}}$$

$$\Rightarrow V_o(1) \approx V_{in}(0)k(1-(1+k)\mu)$$

$$\Rightarrow V_o(2) \approx V_{in}(1)k(1-(1+k)\mu) + V_{in}(0)(1-k\mu)k(1-(1+k)\mu)$$

$$\Rightarrow V_o(3) \approx V_{in}(2)k(1-(1+k)\mu) + V_{in}(1)(1-k\mu)k(1-(1+k)\mu)$$

$$+ V_{in}(0)(1-k\mu)^2k(1-(1+k)\mu)$$