

SC Analysis

The figure below shows an SC circuit driven by two non-overlapping clocks, ϕ_1 & ϕ_2 . Assume that the sampling instants $t = nT_s$ are at the rising edge of ϕ_1 , and that the following capacitors are matched:

$$C_2 = C_3 = C_4 = C_5 = C_x.$$

1. Solve for an approximate continuous time transfer function $H(s) = V_o(s)/V_{in}(s)$ by replacing the capacitor C_4 and associated switching network with an equivalent resistance. Put your solution in the following form and solve for the parameters in terms of C_x , C_1 , and T_s :

$$H(s) = -\frac{s/\omega_o}{1 + s/\omega_p}$$

2. Solve the z-domain transfer function, $H(z) = V_o(z)/V_{in}(z)$.
3. Show that the frequency responses are identical for the two transfer functions, $H(j\omega)$ and $H(e^{j\omega T_s})$, assuming the signal frequency is much less than the sampling frequency, $f \ll f_s$.

