

EEC 212
Problem Set 8 - DO NOT TURN IN
Professor Hurst

Read: Chapter 15

1

The input to the low pass filter (LPF) in figure 1 is $V_{in} = 1V \cos[2\pi(1kHz)t] + 1V \cos[2\pi(103kHz)t]$. Sketch the output spectrum for $f = 0$ to $f = 350kHz$.

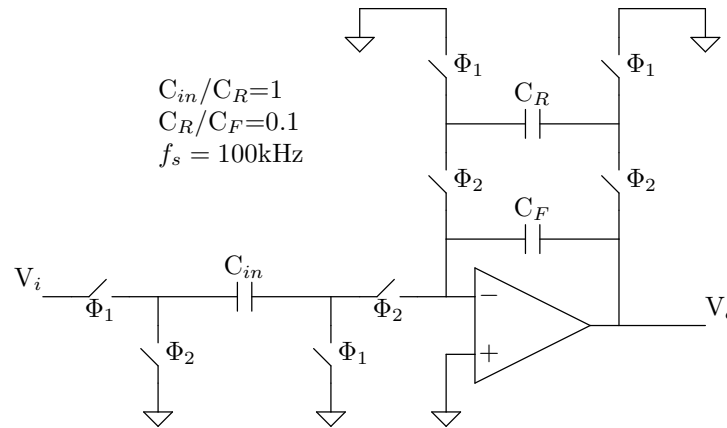


Figure 1: Switch Capacitor Filter for Problem 1

- (a) Ignoring the output hold effect (“Impulse Sample” the output).
- (b) Including the output hold effect.
- (c) Verify your results for (a) & (b) using SWITCAP’s ANALYZE SPECTRUM capability.

2

Using the single-ended G_m -C biquad presented in lecture:

- (a) Design a biquad that has $f_0 = 5MHz$ and $Q = 1$ with DC gain $= -1$. Use ideal elements.
- (b) Verify the design using SPICE. Voltage scale to match the peak outputs across C_1 and C_2 . Impedance scale so that $G_{m1} = 50\mu A/V$.
- (c) Add R_{out} to the G_m cell and observe the effect on the filter as R_{out} decreases (and $G_m R_{out}$ decreases).
- (d) Remove R_{out} ($R_{out} \rightarrow \infty$). Replace G_m with $G_m/(1 - s/p_2)$ and observe the effect on the filter as $|p_2|$ becomes ‘small’ (with $|p_2| > G_m/C$).