ECE 412: Introduction to mixed-signal circuits  (Homework9)

1. For this homework you need to reuse the amplifier in Homework 8 for the switched-capacitor circuit shown in Fig. 1. The schematic of the CMOS switch is shown in Fig. 2. Fig. 3 shows the clock signals that you need to (use \texttt{vpulse} in the NCSU analog library and appropriately set the rise-time, fall-time, start-time, time-period) keeping in mind that the important aspect is the non-overlapping time-period between the clocks. Set the $V_{dd} = 3V$, $V_{ref} = 1.5V$, $V_{in} = 1.6V$ and $C_2 = 1pF$, $C_1 = 100fF$. Run the transient analysis for a total duration of 1ms and plot the signals, $R$, $\phi_1$, $\phi_2$, $V_x$ and $V_{out}$ [15 points].

2. Explain the output $V_{out}$ and $V_x$ using discrete-time equations. [5 points].