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| Lab 5: Ideal Filters and Mixed-mode Circuits |

Student Name: Click or tap here to enter text.

Student Number: Click or tap here to enter text.

Preparation

There is no prelab due this week (YAY!)

Q1: Generic Filter Blocks

1. Go through Example 5.3 of textbook (***"Generic Filter Blocks"***), page 165 and create the band-pass filter. **You must use sub-circuits to create each required filter.** Show your schematic.



1. Plot the frequency response of the designed filter.



1. Run a transient simulation using a 1VP sinusoidal input signal at 20Hz, 10kHz and 20kHz. Determine the output peak amplitude in each case.
2. 20Hz.



1. 10kHz.



1. 20kHz.



1. Run a transient simulation and plot the step response for the filter.



Q2: Mixed Analog/Digital Circuit

1. Go through Example 5.4 of textbook (***"A Mixed Analog/Digital Circuit"***), page 168 and create the ADC. Show your schematics.
2. NAND Gate



1. Converter



1. Switch



1. Top level schematic.



1. Plot the input/output transfer function of D/A converter.



Q3: Ring Oscillator

1. Go through Problem 5.7 of textbook to simulate and characterize a ring oscillator, page 177. (you will need to create an inverter symbol with parameters as described on page 169). Show your schematic.
2. Inverter sub circuit.



1. Top level schematic.



1. Plot the output waveform.



1. Determine the oscillating frequency and inverter delay for both Fanout-1 and Fanout-5.

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1. Explain the difference (if any) in the oscillating frequency between the two ring oscillator version (Fanout-1 and Fanout-5).

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This report is to be completed during the lab period by filling out this pre-made template and handed in within 30 minutes after the end of the session.