# Midterm Project

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## 1 Negative Design Using CMOS Positive Trigger D Latch

### 1.1 Negative Using Positive Trigger D Latch Technich Result

Date and Time: 2025-03-25 12:12:00 PKT

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```
* SPICE 3 file created from Negative_Using_Positive_Trigger_D_Latch.ngspice.sch

.include /home/arslan/Desktop/Midterm/Negative_Using_Positive_Trigger_D_Latch/Negative_Using_Positive_Trigger_D_Latch.spice

* Control statements
.tran 0.1n 100n 0 0.01n
.control
set hcopydevtype svg
hardcopy /home/arslan/Desktop/Midterm/Negative_Using_Positive_Trigger_D_Latch/Negative_Using_Positive_Trigger_D_Latch.svg v(clk) v(d) v(q)
.endc
.end
```

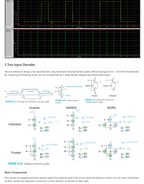
### 1.2 Additional Testbench Non-synchronized Input and Clock Signal

The input signal and clock signal are not synchronized and have different frequencies. This ensures that the latch functions correctly under asynchronous conditions, demonstrating its ability to capture the input signal on the falling edge of the clock.

```
* SPICE 3 file created from Negative_Using_Positive_Trigger_D_Latch.ngspice.sch

.include /home/arslan/Desktop/Midterm/Negative_Using_Positive_Trigger_D_Latch/Negative_Using_Positive_Trigger_D_Latch.spice

* Control statements
.tran 0.1n 100n 0 0.01n
.control
set hcopydevtype svg
hardcopy /home/arslan/Desktop/Midterm/Negative_Using_Positive_Trigger_D_Latch/Negative_Using_Positive_Trigger_D_Latch.svg v(clk) v(d) v(q)
.endc
.end
```



## 2 Flip-Input Decoder

Flip-input decoding is a technique used in digital design to swap the roles of input and output signals, enhancing flexibility and efficiency. This approach is particularly useful in scenarios where the input signals need to be processed in a different order than their original sequence. By leveraging flip-input decoding, designers can optimize circuit performance and simplify the overall design process.

Flip-input Decoder
Inverter
Inverter
Inverter