LAB-3 Various CMOS Logic Families

Based on XOR circuit, analyze the circuit characteristics of three different Logic Families:

1. Observe the performance results in terms of power, delay, and pdp when the circuit is faced with **different loadings** under a fixed size.
2. Observe the performance results of **different circuits** in terms of power, delay, and pdp.

Using the same test pattern:

```
va  a   0   pulse(1.8 0   0.1n   0.1n   0.1n   39.9n   80n)
vb  b   0   pulse(1.8 0   0.1n   0.1n   0.1n   79.9n   160n)
vc  c   0   pulse(1.8 0   0.1n   0.1n   0.1n   159.9n  320n)
.tran   0.1n    640n
```

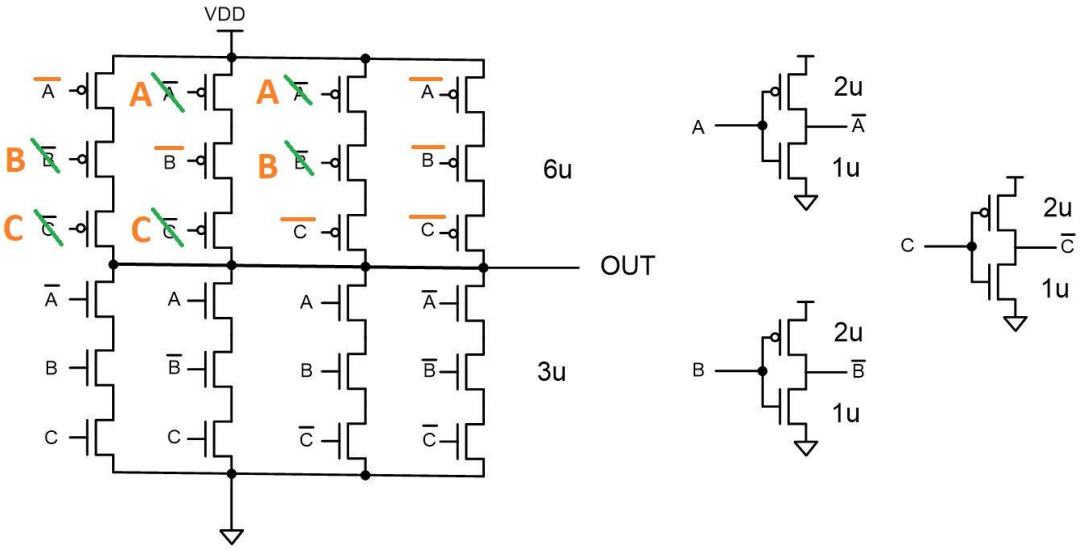
LAB3-1：Static CMOS 3-input XOR (25%)

Write 3-input Static CMOS XOR SPICE, observe the waveform and measure Delay time，Power consumption，Power-Delay-Product。

1. Size: L=0.18u, W: Please size it according to the figure below.
2. Using fixed loading capacitance c=0.05p

3. **(extra practice)**Modify your input pattern with 2 times, 4times ,8 times, and 16times frequency (Record the Delay time and Power consumptio according to Frequency changes in Excel.)

Static CMOS 3-input XOR：



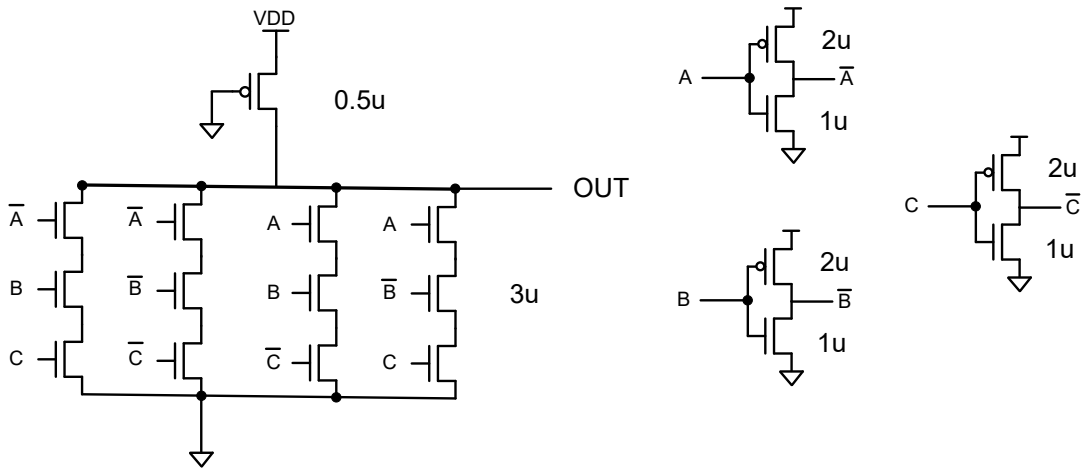
LAB3-2：Pseudo-NMOS 3-input XOR (25%)

Write 3-input Pseudo NMOS CMOS XOR SPICE, observe the waveform and measure Delay time，Power consumption，Power-Delay-Product。

1. Size: L=0.18u, W: Please size it according to the figure below.
2. Using fixed loading capacitance c=0.05p

3. **(extra practice)**Modify your input pattern with 2 times, 4times ,8 times, and 16times frequency (Record the Delay time and Power consumptio according to Frequency changes in Excel.)

Pseudo-NMOS 3-input XOR：



LAB3-3：Pass-transistor 3-input XOR (25%)

Write 3-input Pass-transistor CMOS XOR SPICE, observe the waveform and measure Delay time，Power consumption，Power-Delay-Product。

1. Size: L=0.18u, W: Please size it according to the figure below.
2. Using fixed loading capacitance c=0.05p

3. **(extra practice)**Modify your input pattern with 2 times, 4times ,8 times, and 16times frequency (Record the Delay time and Power consumptio according to Frequency changes in Excel.)

Pass- transistor 3-input XOR：