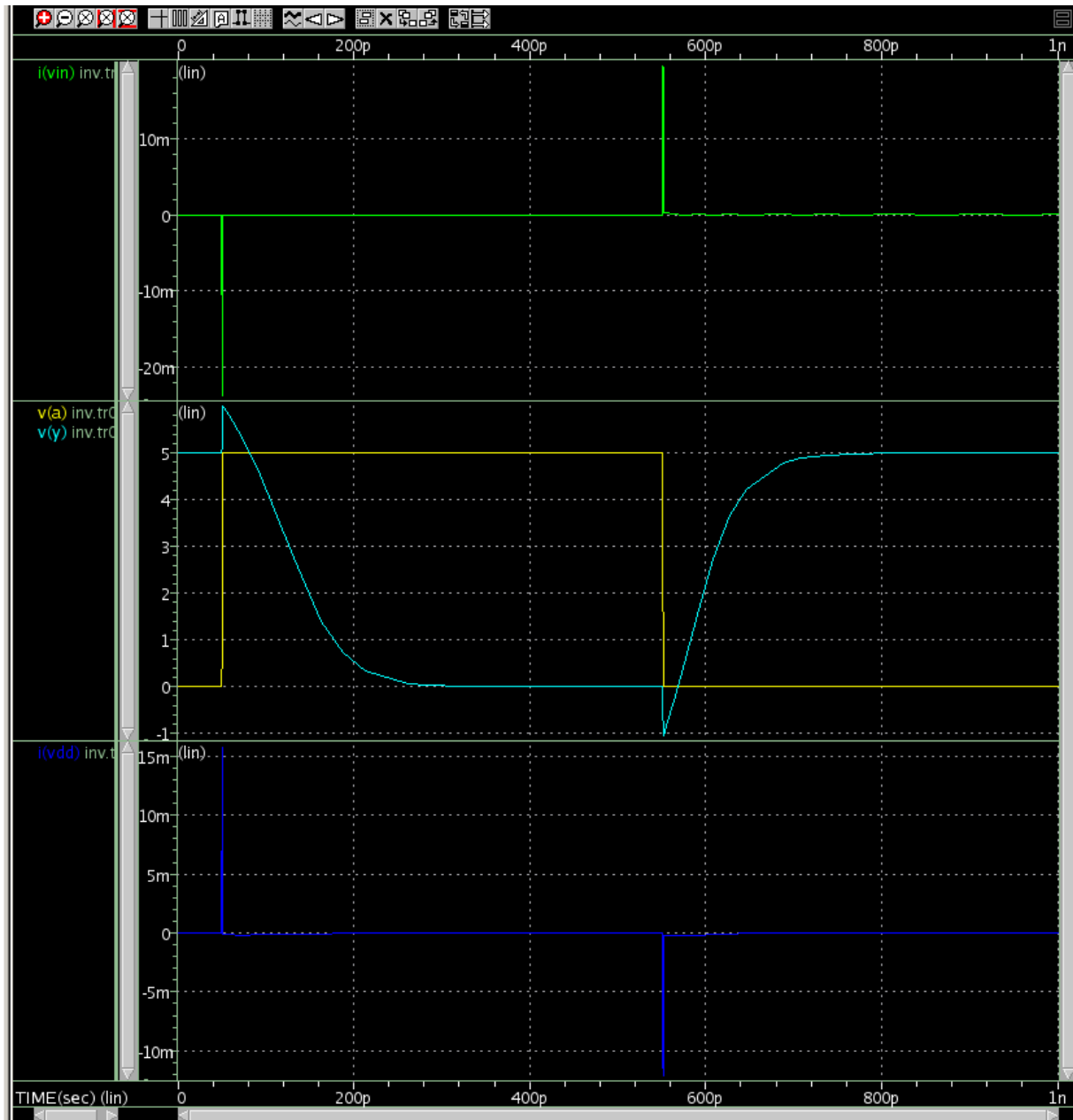# ECE 425 VLSI Circuit Design Lab 4 prelab

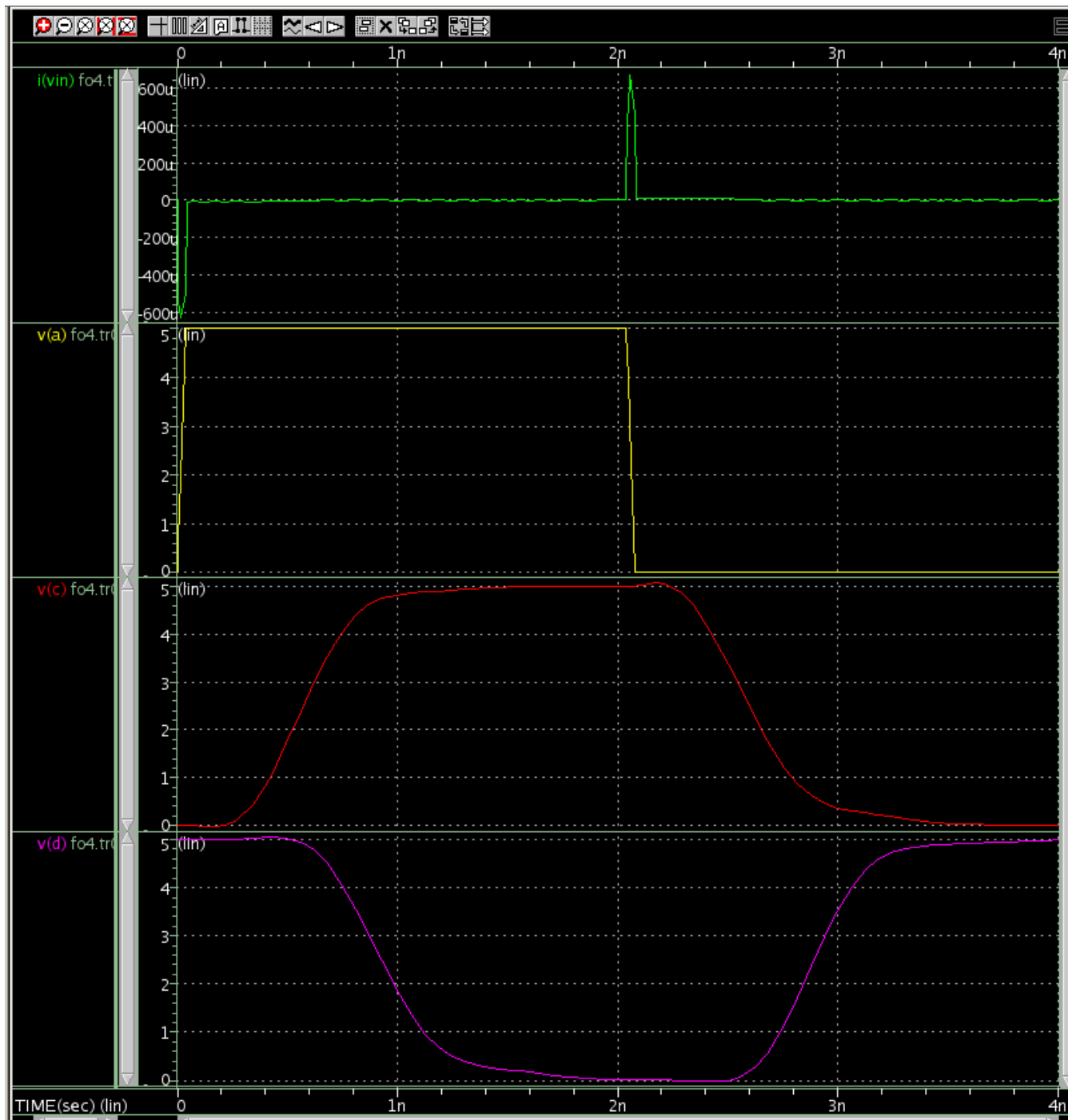Lab partners: YI HAN, Kemal Dilsiz.
Time: Mar, 7, 2017

**wv inv.tr0   waveform**

**wv Fo4.tr0   waveform**

## The time measurement of Fo4

****** transient analysis tnom= 25.000 temp= 70.000 ******
 tpdr= 291.3731p  targ=  2.8921n  trig=  2.6007n
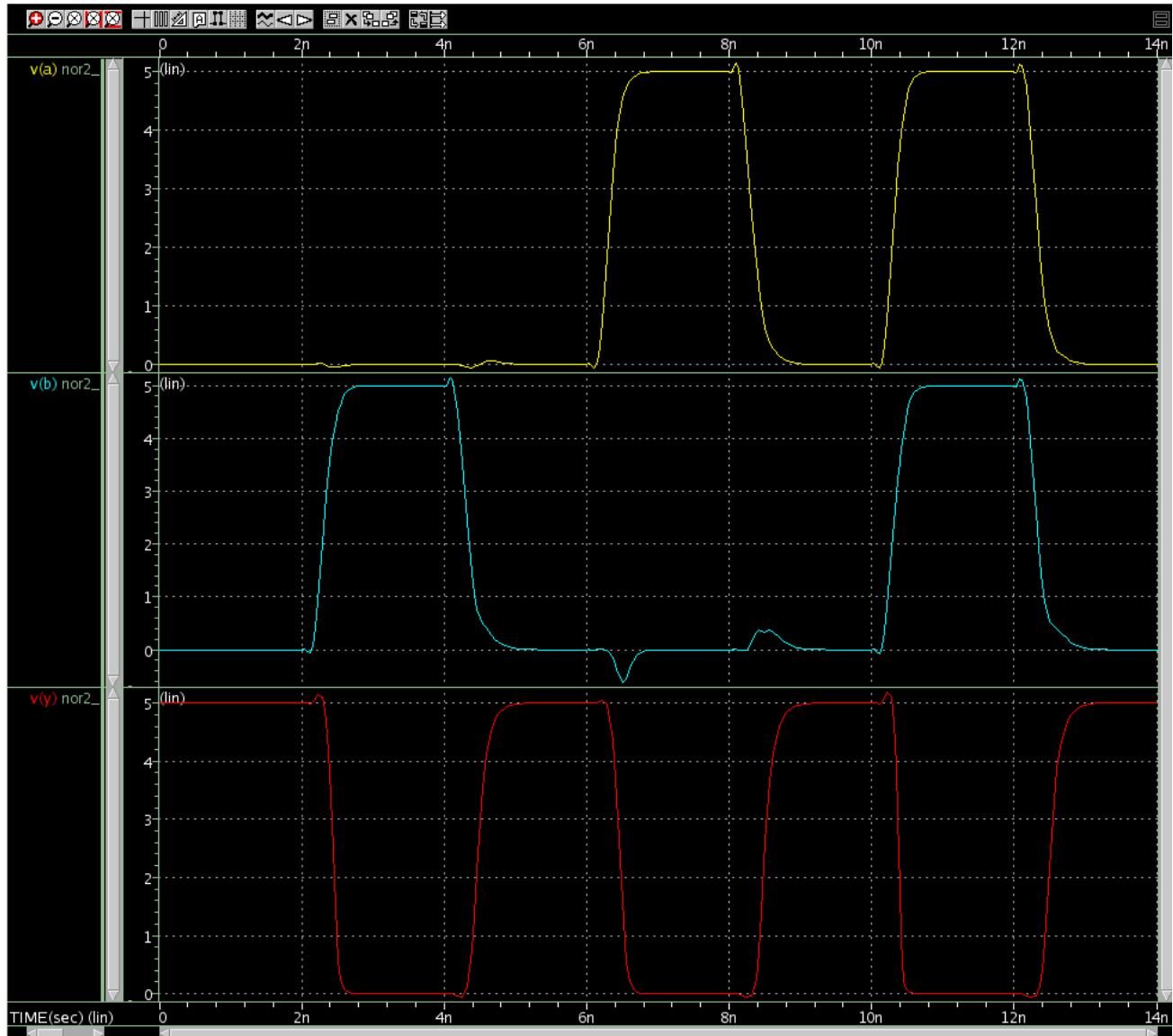 tpdf= 355.7412p  targ= 927.3073p  trig= 571.5661p
 tpd= 323.5572p
 trise= 323.1150p  targ=  3.0624n  trig=  2.7393n
 tfall= 369.0093p  targ=  1.1214n  trig= 752.3502p

## wv nor_lx_bench.tr0 waveform

**Time measurement of nor2_1x_bench**

****** transient analysis tnom=  25.000 temp=  70.000 ******
tpdr_a= -3.8448n  targ=  4.4787n  trig=  8.3235n
tpdf_a= -3.8819n  targ=  2.4390n  trig=  6.3209n
tpd_a= -3.8633n
tpdr_b= 162.9026p  targ=  4.4787n  trig=  4.3158n
tpdf_b= 116.1930p  targ=  2.4390n  trig=  2.3228n
tpd_b= 139.5478p
trise= 176.7381p  targ=  4.5781n  trig=  4.4014n
tfall= 103.8105p  targ=  2.4889n  trig=  2.3851n

**The best and worst case of Zero detect circuit waveform**
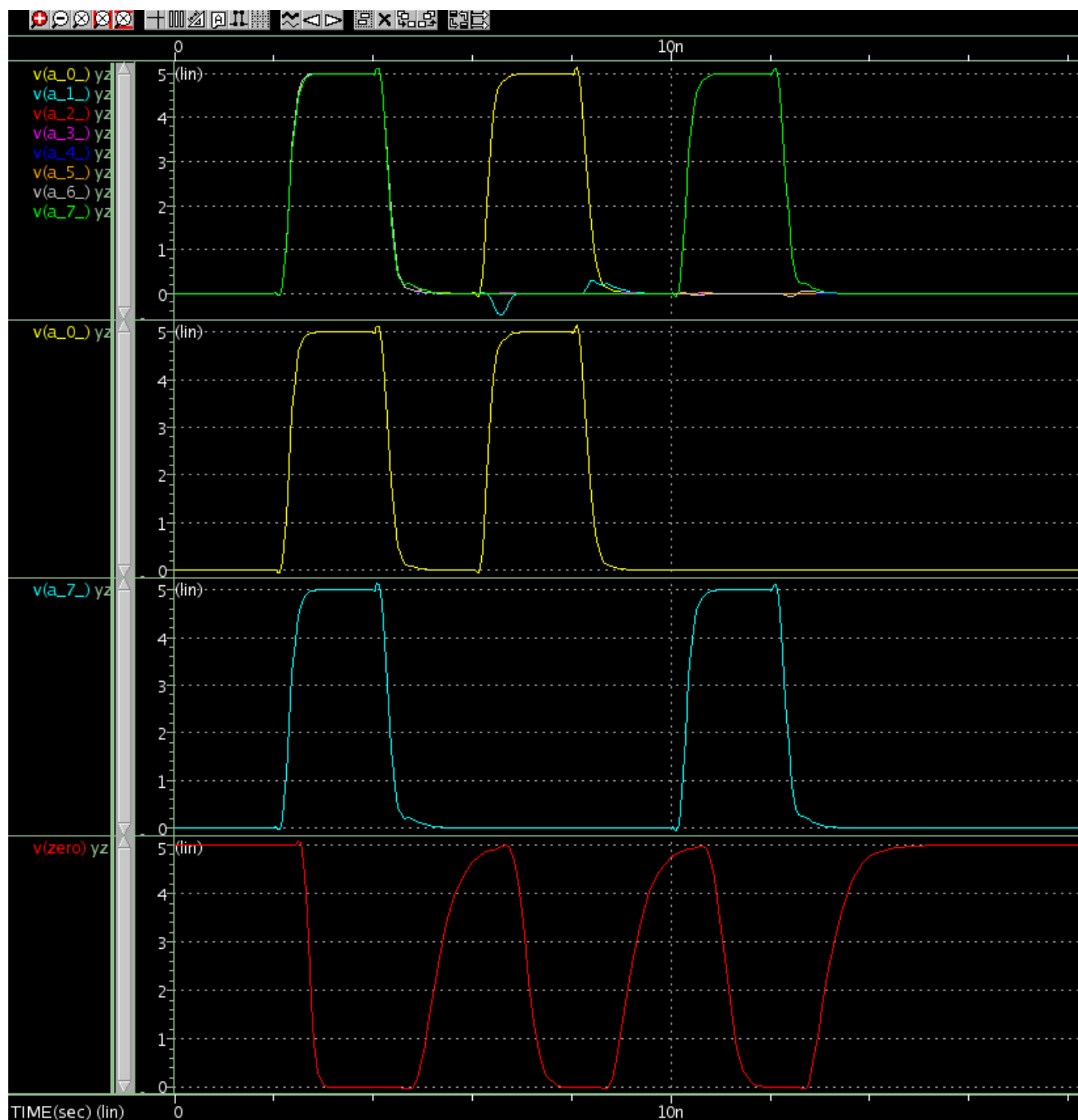
We have observed through the wavelength simulations that the High to Low change in the single input makes the worst delay in the output. For example, for the nor gate, when **'a'** input is 1 and **'b'** input is 0, if the **'a'** input goes down to 0 as well, this will create the worst delay in the output. There was no significant difference between which input node changes. The best case scenario was when both inputs are turned on and turned off. This is because the resistance goes down with the parallel structure of the mos gates.

Observing this situation from the NOR gate. We have concluded that the best case for Yzerodetect would be the situation where all inputs are turned on. This can be seen as the first change in the simulation picture that we have attached. Then for the worst case scenario, only **a_0_** or **a_7_** should be changed because this would create the highest possible resistance similar to the NOR gate situation. We have simulated both of these situations in out data: first turning on and off **a_0_** and then turning on and off **a_7_**. Again, this is observable in our picture from the simulation.

```
****** transient analysis tnom=  25.000 temp=  70.000 ******
tpdr_a_0= 977.6504p  targ=  5.2986n  trig=  4.3209n
tpdf_a_0= 397.0092p  targ=  2.7184n  trig=  2.3214n
tpd_a_0= 687.3298p
tpdr_a_7= 987.5224p  targ=  5.2986n  trig=  4.3111n
tpdf_a_7= 395.5124p  targ=  2.7184n  trig=  2.3229n
tpd_a_7= 691.5174p
trise= 594.5535p  targ=  5.6515n  trig=  5.0570n
tfall= 167.5948p  targ=  2.8075n  trig=  2.6399n
```