Tutorial 4: Power and maximum frequency of the signal.

Objective:

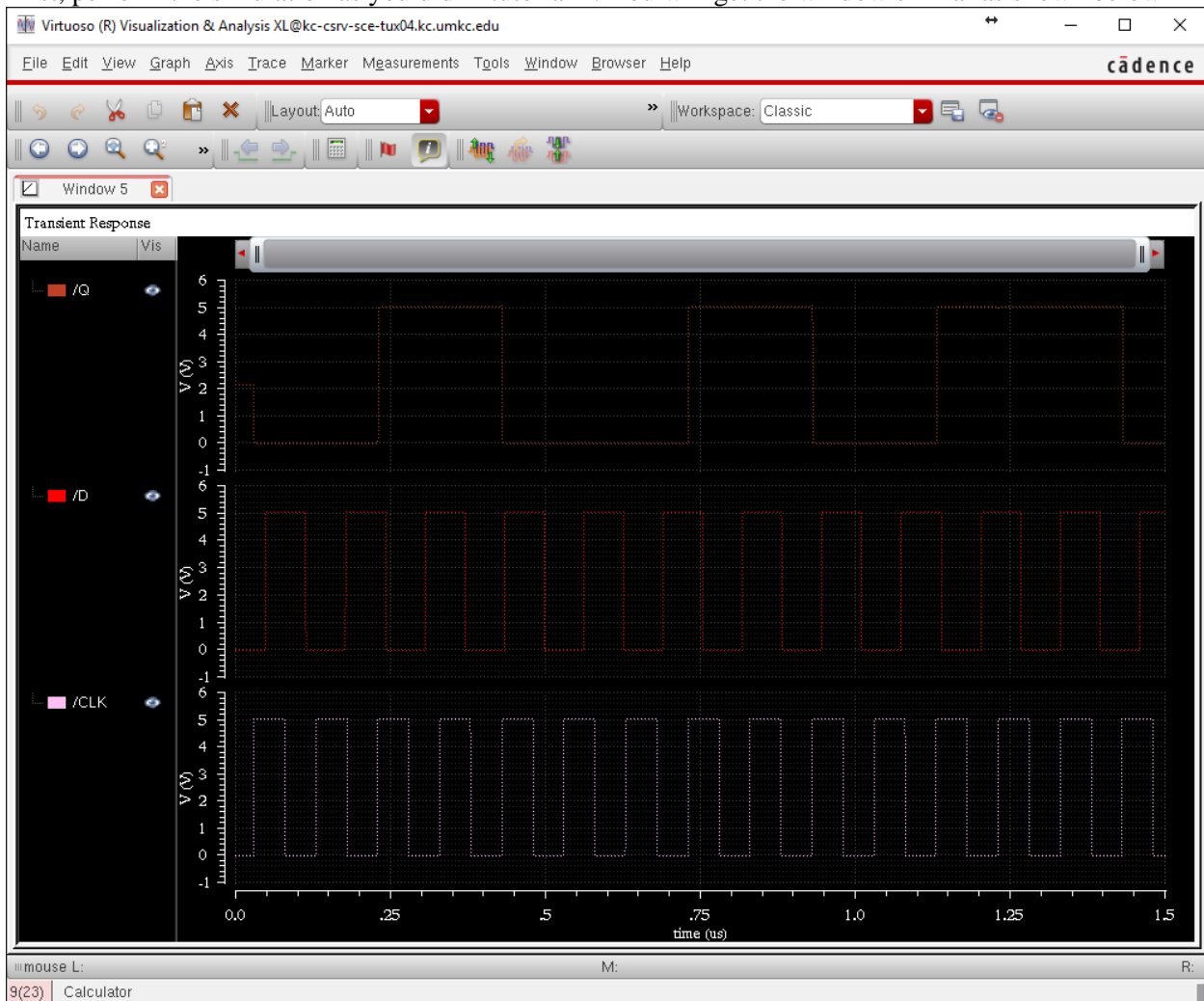To calculate the power and maximum frequency of the signal.

Tasks:

1. You have to find the power and frequency of the input and output signal.
2. Calculate the power and frequency for simulation of schematic and layout.

Procedure:

PART I: Frequency Using Calculator
First, perform the simulation as you did in tutorial 2. You will get the window similar as shown below
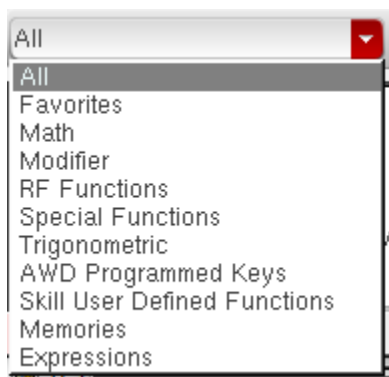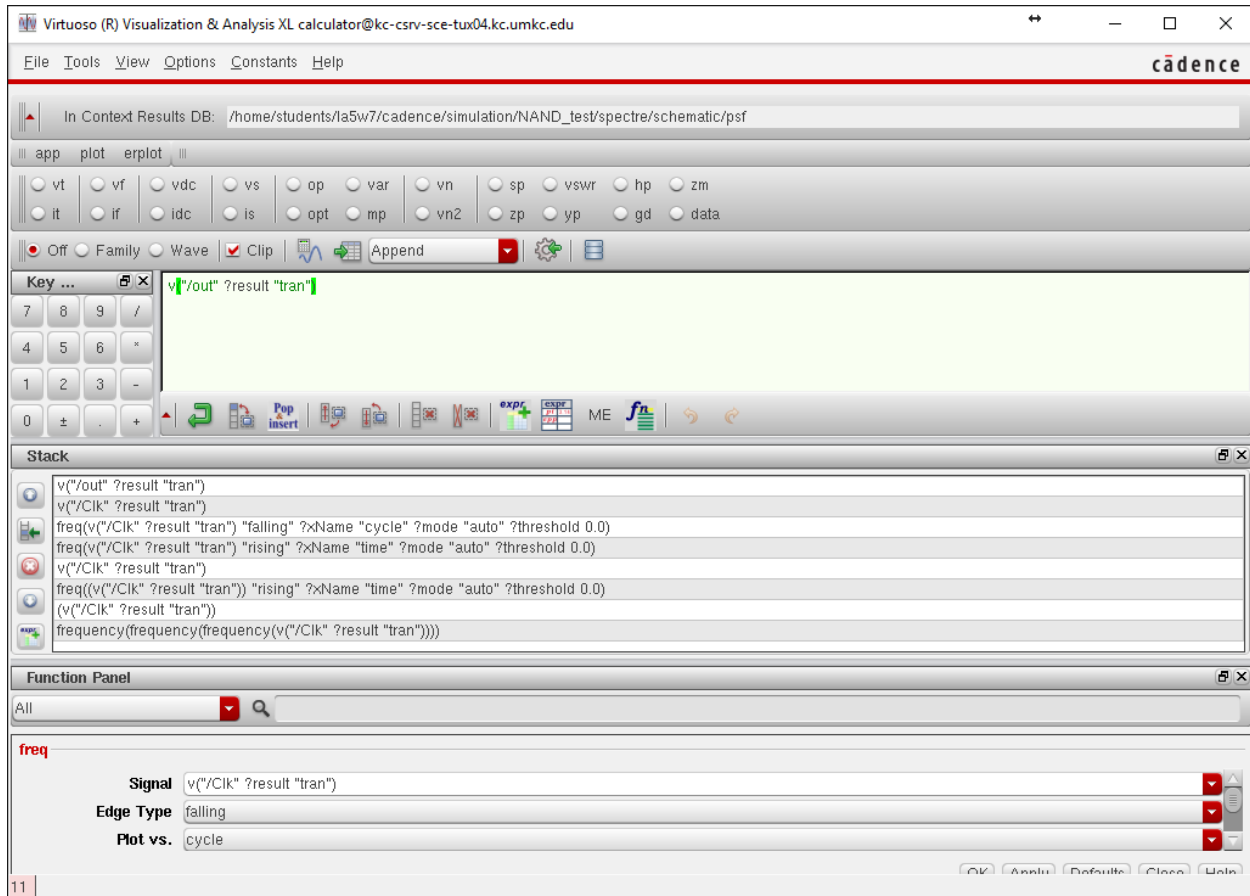

The formula for the maximum frequency calculation is

$$f = \frac{1}{t_r + t_f}$$

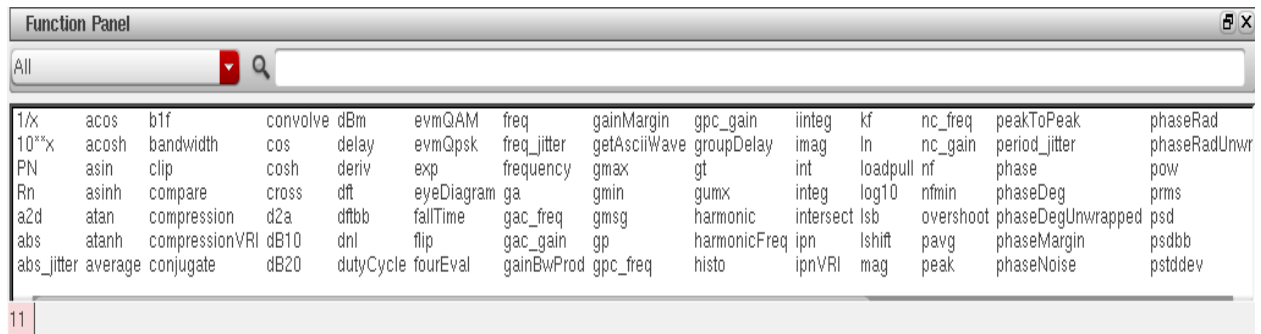Where t_r = rise time and t_f= fall time. You will calculate the rise time and fall time by calculator.

Click on the waveform you want to calculate, it could be in1 in2 or out. For example, click on in1signal,
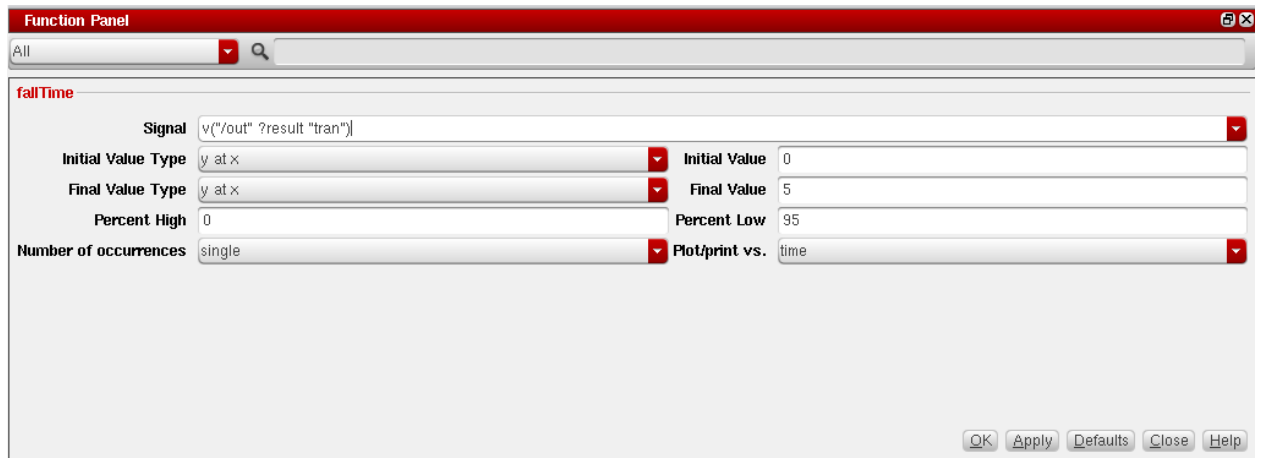
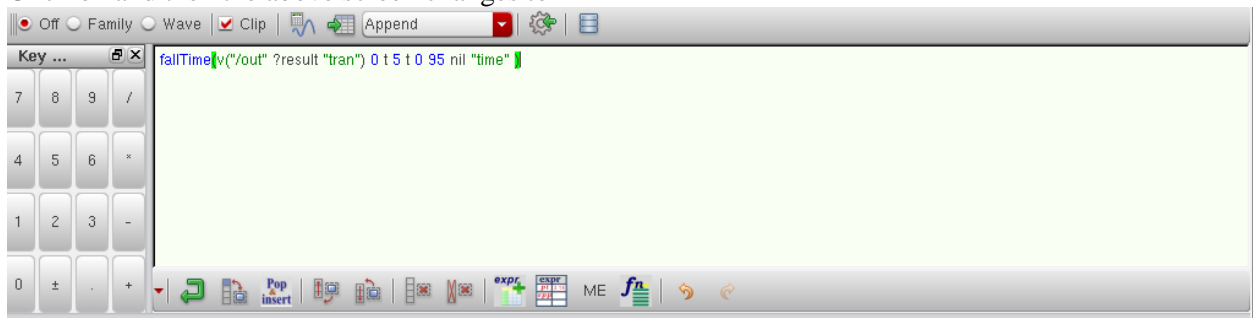then click the calculator button that is .
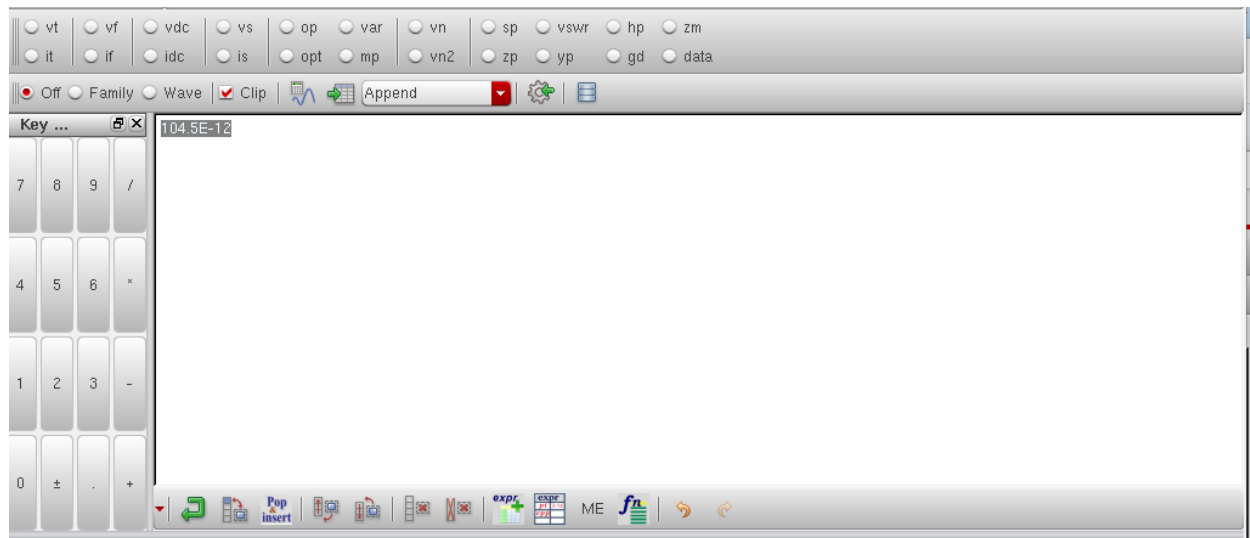

Then click on the All.

Click on the falltime

Click ok and then the above screen changes to

Click on the button Evaluate the buffer.

So you can see the value for fall time is 104E-12, whereas we have entered the value as 110E-12(110ps). So your t_f = 104E-12.

Close the calculator window and do that for rise time. You will get the value for rise time as 104.5E-12. So your t_r = 104.5e-12. Put the values in equation above and you get

$$f = \frac{1}{104E-12 + 104.5E-12} = 4.79E9$$
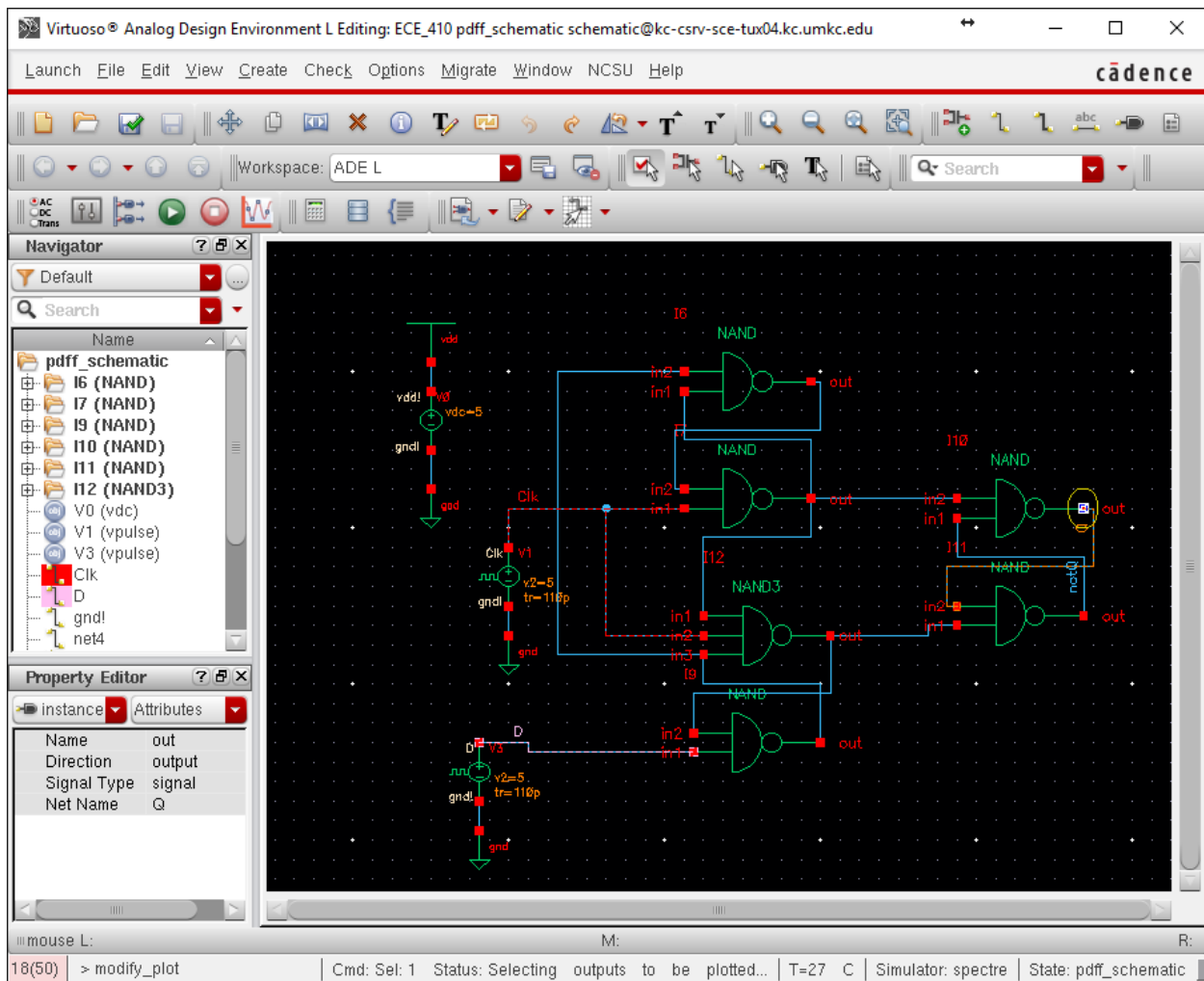
PART II: Power Calculation
For power calculation, you first have to add the point at which the output is coming to your simulation variables. Note that you have to calculate for the test_schematic circuit.

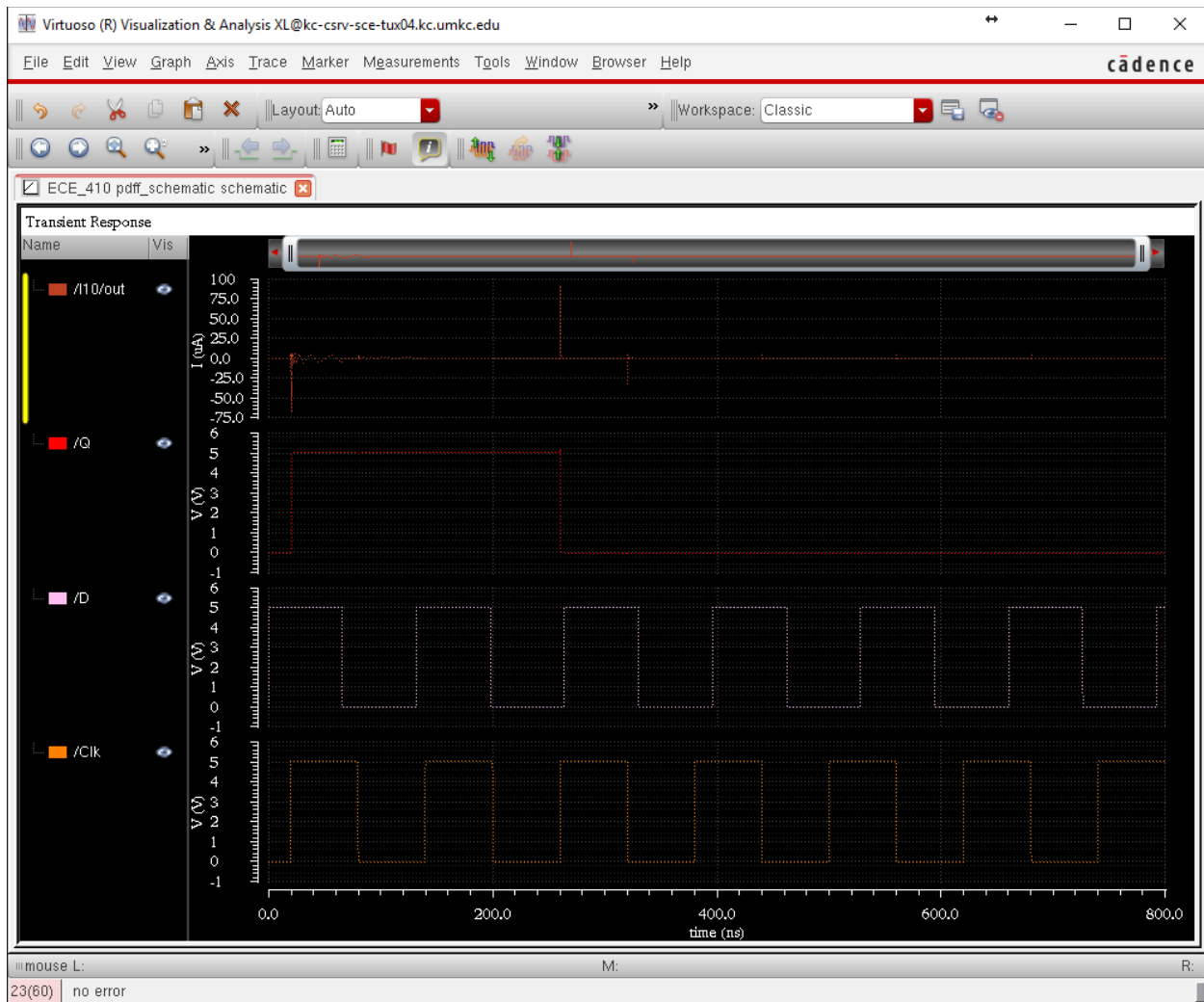Then perform the simulation you might get the output as
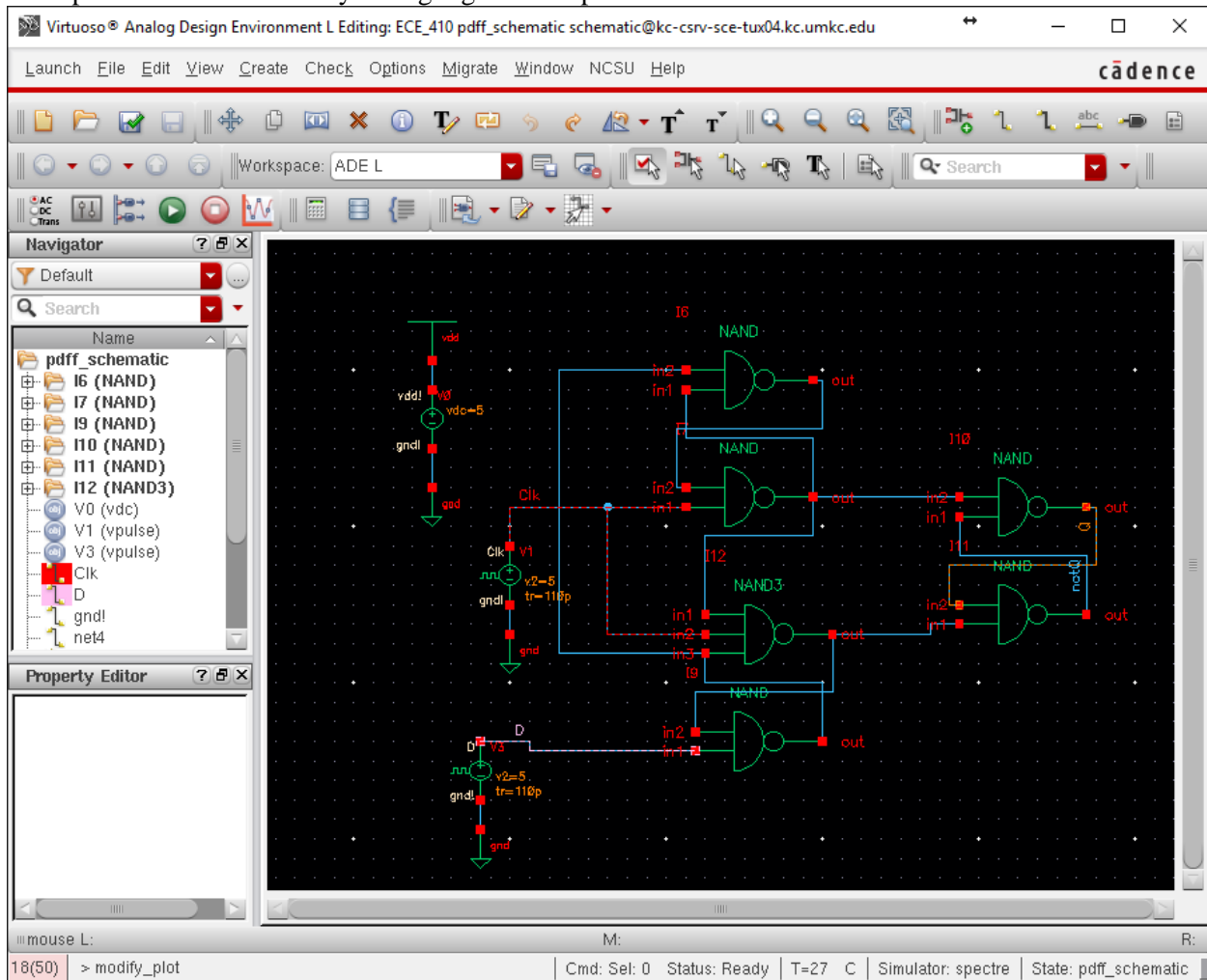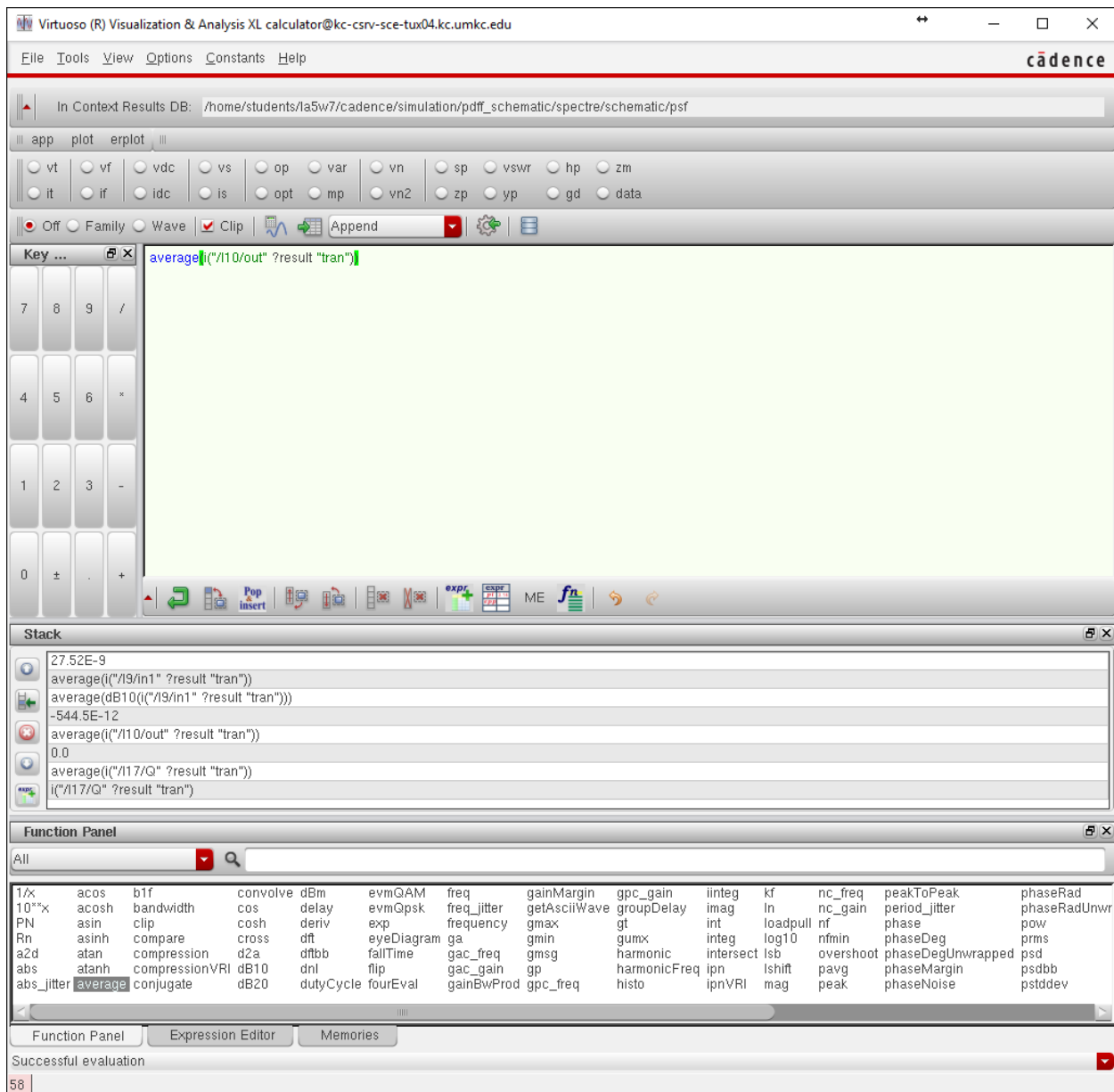

Now select the output current node.
By Outputs→ to be plotted → select from Schematic

Perform the simulation and then you will get output as

Select the /I10/Out signal and then click ok the calculator

After that select the average function from All.

Click on the button ![button] Evaluate the buffer.

You will get the average current value as 548.6E-12. The formula for Power is

$$Power = V * I$$

Where V = applying voltage which is fixed at 5V
I = average current which can find out from the cadence calculator.

So for calculation the power is

Power = 5V * 548.6E-12 = 2.473E-9