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1) Consider a 5 in x 5 in, 4 wire resistive touch screen, given the following measurements, locate the touch point: 10pts

Assume: resistivity = 1K ohm / inch

Drive voltage = 7V at top and right

Y measurement = 2.77V

X measurement = 1.43V

Define the origin at the lower left corner

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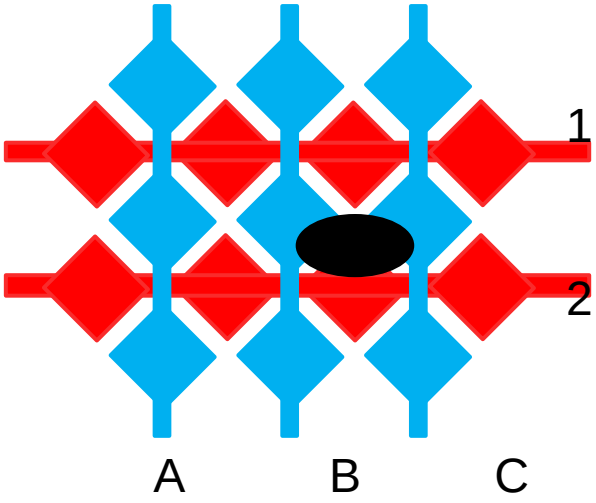
2) Consider a projective capacitance touch screen (4 wide by 3 high) using the mutual capacitance approach. Determine the expected measured voltage for each column with a) row 1 selected and b) with row 2 selected 30pts

Assume: total row/column to ground capacitance = 100fF/row or column
mutual capacitance between R/C sensors = 15fF / edge
Active row = 3v
All idle rows grounded
Touch (black oval) – reduces the mutual capacitance to 5fF/edge



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3) Using the 4T APS shown in class, what value would you expect on the output of the source follower: 20pts

Assume: unity gain on the source follower, Vgs=0.55v

C sense amp = 0.5pF
Diode Area = 6um x 6um
Idark = 10pA/cm^2
I generated = 5pA
Reset voltage = 3V
electronic shutter open for 10ms after reset removed
ignore all parasitic elements
ideal sampling switch and output switch

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4) Part of what is transmitted in a satellites GPS packet is the time at which the packet is transmitted(according to the satellite) and the satellite's position in 3-space. The receiver then compares it's time to the decoded transmit time to determine the transit time for the signal. Assuming the satellite times are correct, calculate the receiver location(x,y,z) and the receiver time error t_{error} , given: 40pts

Use C = 186,282mi/sec

sat1: t_{t1} = 2:2:20.15, x= 1000mi, y= 2000mi, z= 11000mi
sat2: t_{t2} = 2:2:20.16, x= 2000mi, y= 1500mi, z= 11010mi
sat3: t_{t3} = 2:2:20.155, x= -2000mi, y= -1250mi, z= 11005mi
sat4: t_{t4} = 2:2:20.165, x= -2200mi, y= 1040mi, z= 11007mi

Receiver:
t_{r1} =2:2:20.207784552
t_{r2} =2:2:20.218089877
t_{r3} =2:2:20.213994840
t_{r4} =2:2:20.223684855