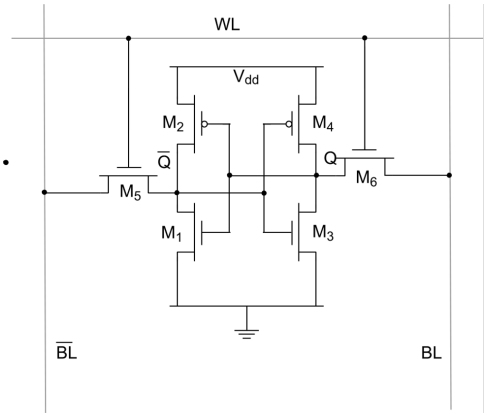
Below is the 6T SRAM cell. We will look at the operation of this cell through a read operation and then a write operation to change the bit value stored in the cell.



1. Assume the cell has a 1 stored ($Q = 1$, $\overline{Q} = 0$). During the read operation the bitlines (BL & $\overline{BL}$) are precharged high, and then the wordline (WL) goes high.

   (a) Which two transistors are discharging $\overline{BL}$ to Gnd?

   (b) What regions of operation are the transistors in?

   (c) Assuming the node between the two transistors has a peak voltage of ΔV, write the KCL equation for the two transistors.

2. Again assume the cell has a 1 stored ($Q = 1$, $\overline{Q} = 0$). During the write operation the bitlines (BL & $\overline{BL}$) are driven with the write data such that $BL = 0$ and $\overline{BL} = V_{dd}$, and then the wordline (WL) goes high.

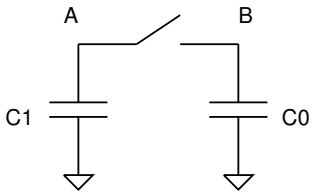
   (a) Which transistor discharges Q to Gnd?

   (b) Which transistor must it overpower to discharge Q?

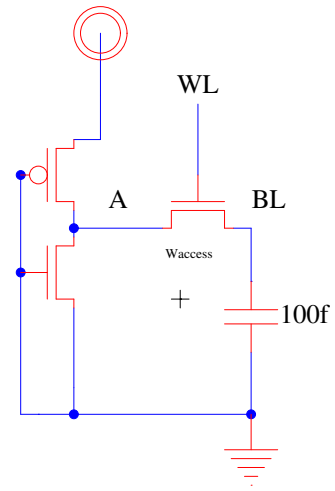
   (c) What regions of operation are the transistors in?

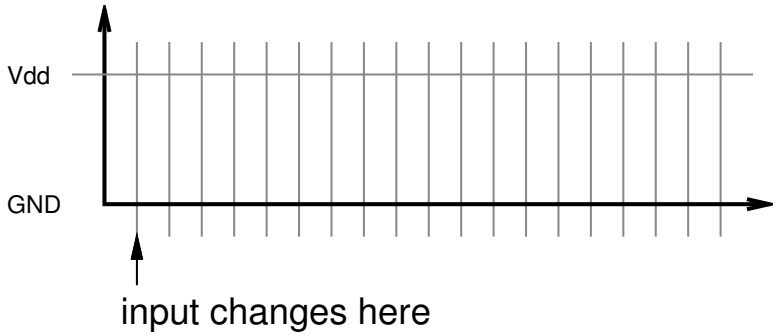
   (d) Assuming the voltage at Q is V_Q, write the KCL equation for the two transistors.

3. Initially: The switch is open and node A is charged to 1V and node B is charged to 0V.
   What is the voltage at node A in steady state after the switch is closed?



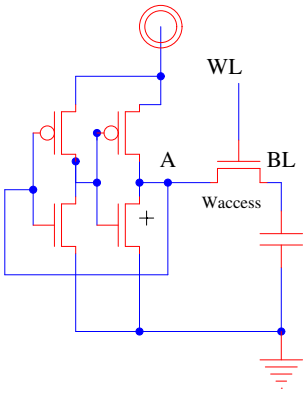
4. What is the waveform on A after WL transitions from 0 to 1?

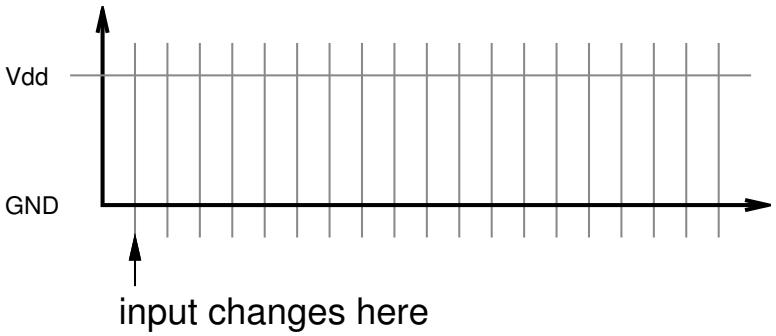




   Assume BL initially at 0. How does it depend on W_{access}?

5. What is the waveform on A after WL transitions from 0 to 1?





   Assume:

   - BL initially at 0
   - A initially at 1

   How does it depend on W_{access}?