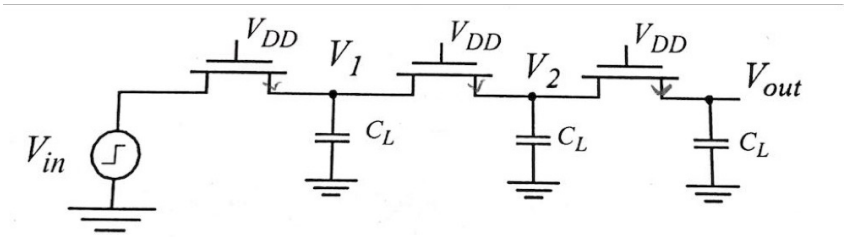
Hw 3 Question



V_{thn}=0.4V, $\mu_n C_{ox}$ =115μA/V², λ =0, γ=0V$^{1/2}$

Consider the circuit in Figure. **VDD=2.5V, C_L = 30fF** All transistors are originally minimum size devices. Use the given transistor parameters. Leakage effects should be ignored.

a. Assume that the initial voltage on V_{out} = 0V. A step from 0 to V_{DD} is applied at the input. Determine the final voltage at V_{out}
b. Assume the following parameters for the minimum size transistors R_{eq} = 15kΩ, C_{gs} = C_{gd} = 2fF, C_{sb} = C_{db} = 1fF. To determine the propagation delay of the circuit. We would like to use an equivalent circuit that includes the resistances and capacitances of the transistors. Please draw this circuit including all relevant resistors and capacitors.
c. Determine the propagation delay between the input and output for a step at the input from 0 to V_{DD}
d. Assuming that the transistor capacitors increase proportionally and resistors change inverse proportionally with the transistor width. Determine a size increase factor S that applies to all the transistors such that the overall delay of the circuit is reduced to half the original value.