

EE-241. Introductory Electronics Laboratory

Lab 8 Handout*

Fall 2009

Mandatory Reading

Read *all* steps in Experiment 11 of Y. Tsividis *pg.* 82 - 89.

Exercise Due Date

Week of Nov 9th.

Prelab Problems

1. Perform experimental steps 1-6 using PSPICE. Sketch I-V curves for NMOS transistor.
Hint: Use component MbreakN to do this part. See the Fig. 1 for reference
2. Use PSPICE to observe the effect of interchanging source and drain (symmetry). Do you see any changes in device operation?
3. What are the operating regions (modes) of MOSFET? Can you write an equation for the ohmic (linear) region?
4. Consider the network in Fig. 2. First assume that $v_{out} = 0$ at time $t = 0$. Then write the equation for $v_{out}(t)$ for $t \geq 0$ given that v_{in} steps from 0 V to V_1 at $t = 0$.
5. For the transient obtained in question 4, determine the time at which v_{out} reaches a given V_T where $0 < V_T < \frac{R_2}{R_1+R_2} V_1$.
6. *Matched* transistors have the identical properties i.e. if same terminal voltages are applied to both devices, their channel currents would be the same. For two matched NMOS transistors connected in *parallel* and *series* as shown in Fig. 3, find the relation between current $I_{combined}$ and $I_{individual}$ for both cases.

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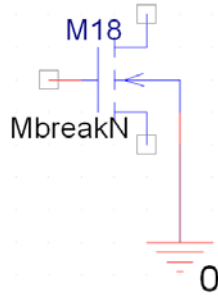


Figure 1: NMOS transistor model for question 1

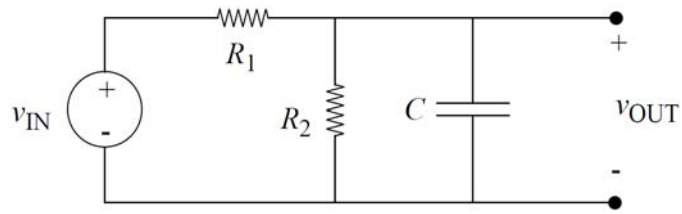


Figure 2: Network for pre-lab question 4

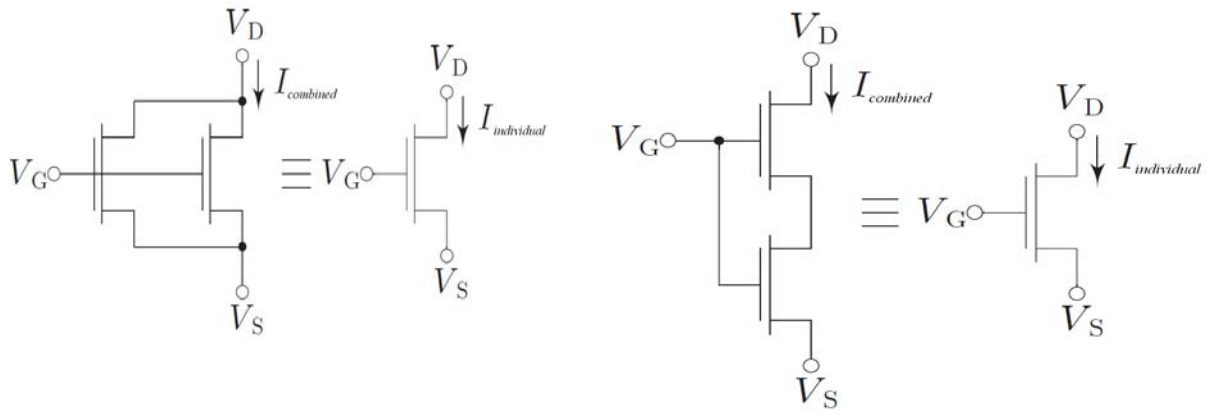


Figure 3: Matched parallel and series MOSFET