

Principles of electronic design (52431A)

Exam 13.02.2004

- Determine currents (I_1 , I_2) and voltages (U_1 , U_2) shown in Figures 1 and 2.
 - Determine voltages (U_1 , U_2 and U_3) in the operational amplifier circuit shown in Figure 4.
- Calculate the voltage and current amplifications together with the input and output impedances of the circuit shown in Figure 4. β is 100.
 - with $R_{E2}C_E$ connected
 - without $R_{E2}C_E$
 - with C_E connected, $R_{E2} = 0$
- What is the operating point current (I_{DS}) of the transistor M1, shown in Figure 5, when V_o lies in the middle of power supplies (about) ?
 - What should the voltage V_{gs} of the M1 be (dc-bias)?
 - What is the ac-amplification v_o/v_i around the operating point?
- Draw the schematic diagram of three input CMOS-NAND –gate in transistor level. Mark in your drawing the so-called pull-up and pull-down networks and give their logic functions.

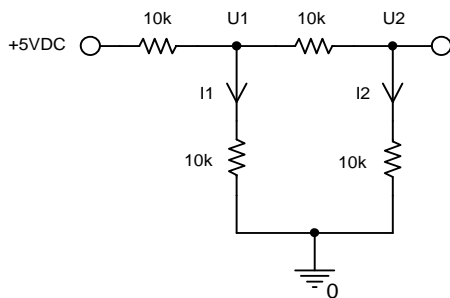


Figure 1.

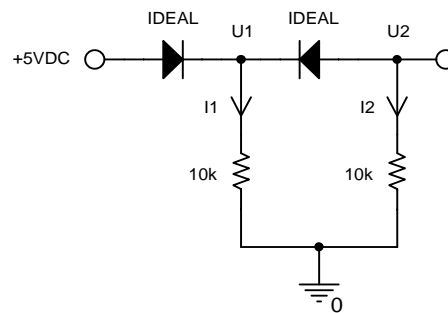


Figure 2.

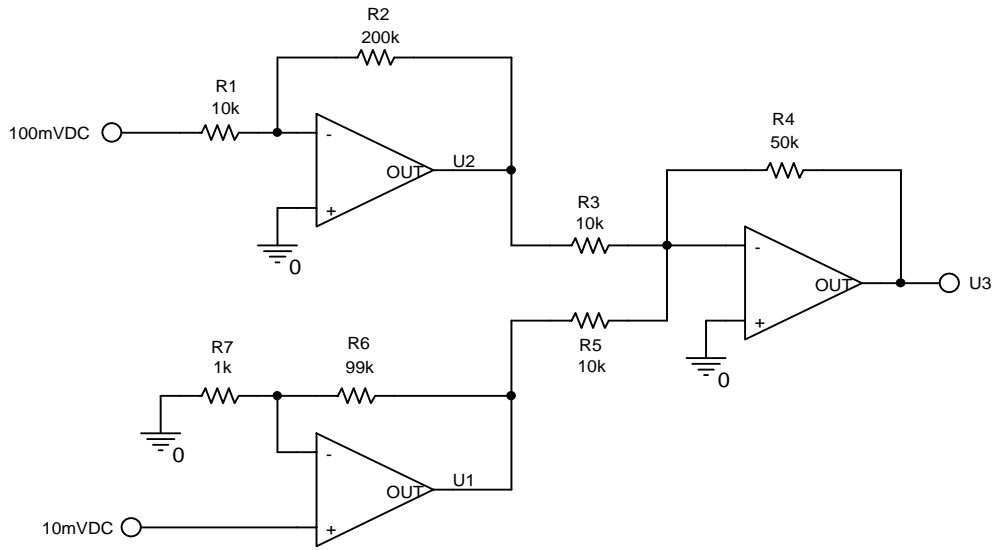


Figure 3.

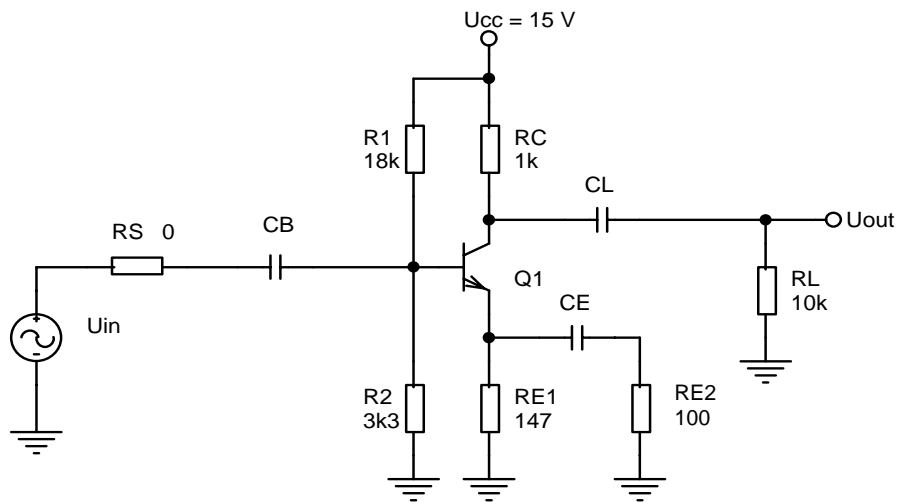


Figure 4.

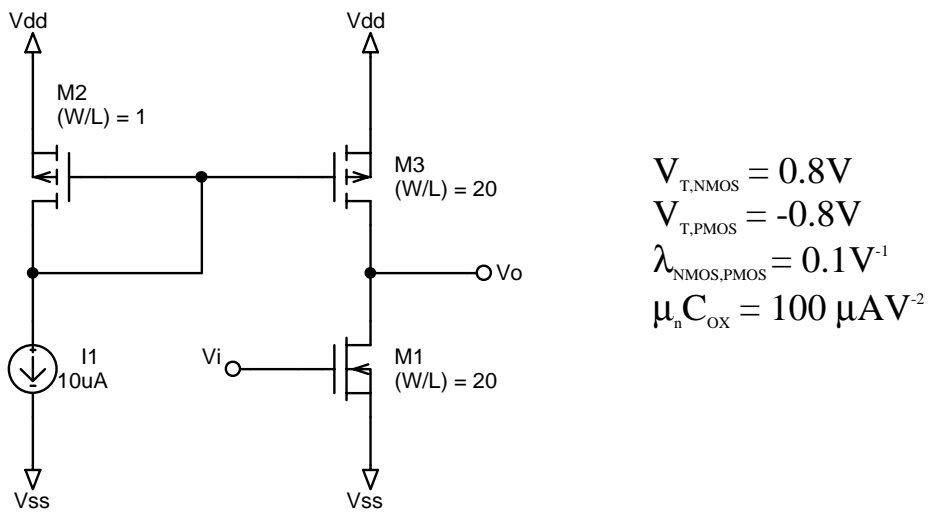


Figure 5.