MICROELECTRONICS AND VLSI DESIGN-SAMPLE QUESTIONS

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1. In the circuit of Figure 1, find R_{in}. The opamp is ideal.

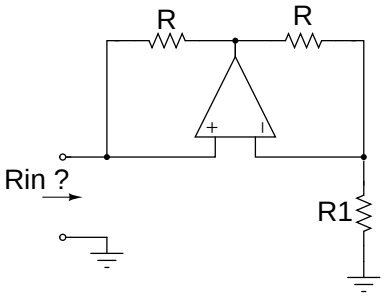

Figure 1: Figure for Problem 1

2. Find V_{CE} of the transistor in Figure 2. You may assume that the V_{BE} of the device is $0.7\,\mathrm{V}$, and that the device has a very high β.

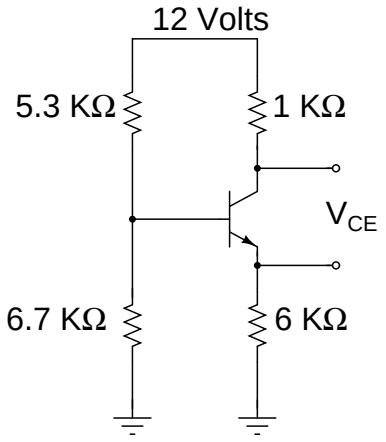

Figure 2: Figure for Problem 2

3. For the circuit shown in Figure 3, mark the inverting and noninverting terminals of the opamp to ensure negative feedback operation.

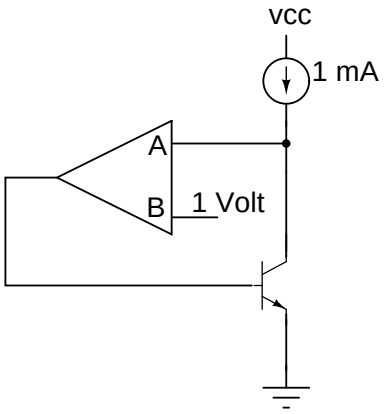

Figure 3: Figure for Problem 3

4. Find the logic equation realized by the circuit shown in Figure 4.

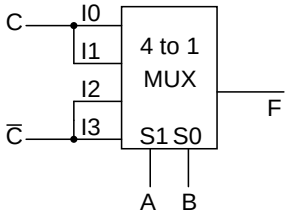

Figure 4: Figure for Problem 4

5. Refer to Figure 5. The waveform at S is shown. For $t < 0$, $Q = 0$. Sketch the waveform at Q for $t > 0$. The NOR gates have a propogation delay of T_d.

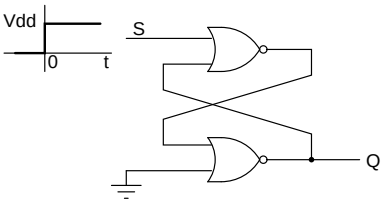

Figure 5: Figure for Problem 5

6. A reverse biased p^+n diode has a depletion region of width W, and a voltage of V_1 volts across the junction. The n region is uniformly doped. Neglect ϕ_{bi}, the built in potential of the junction. What is the voltage required across the diode increase the depletion width to $2\,W$?

7. Suppose we have in 2's complement form, the binary numbers 10011 and 01011. Determine the product. (1 mark)