Examples of Technical Interview Questions

BJT

1. Draw a circuit diagram of a BJT. Name all terminals. Explain all modes of operation, when they are used, and their conditions.
2. Is a BJT a current-controlled or voltage-controlled device?

MOSFET

3. Draw circuit diagrams of NMOS and PMOS devices.
4. Draw a cross section of NMOS and PMOS. Label all parts of the MOSFETS and explain its operation.
5. Name and explain all modes of operation of an NMOS, when /what they are used for, and the conditions for them.
6. Draw the I-V characteristic graph of an NMOS. Label all modes of operation.
7. Label parasitic capacitances on an NMOS device. Which ones are the most significant, and why?
8. Comparing the two, which one would increase the capacitance of an NMOS the most, width or length of the channel? **
9. How would you decrease the gate capacitance of a MOSFET? **
10. Is a MOSFET a current-controlled or a voltage-controlled device?

Digital Logic

11. Draw the CMOS implementation of an Inverter.
12. Draw the CMOS implementation of 3 cascaded inverters.
13. Draw the CMOS implementation of an Inverter using only 1 MOSFET (Tip: can use capacitors and resistors).
14. Draw a CMOS implementation of a NAND gate.
15. What is the difference between a latch and a flip-flop?
16. Draw a D-Flip Flop implementation using D-gated latches.
17. Write VHDL code for a latch.
18. Write VHDL code for a D-gated flip flop? How is it different from a latch?
19. Explain what is "hold time" and "setup time". Why are they important?
20. Draw the cross diagram of a CMOS implementation of an Inverter and label all the parts.
21. How would increase the speed of signal propagation through a CMOS circuit? What are the bottlenecks/limiting factors? ** (hard)

22. Write the timing and output diagram of the following circuit. Assume your own input:
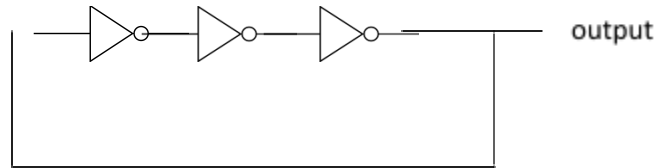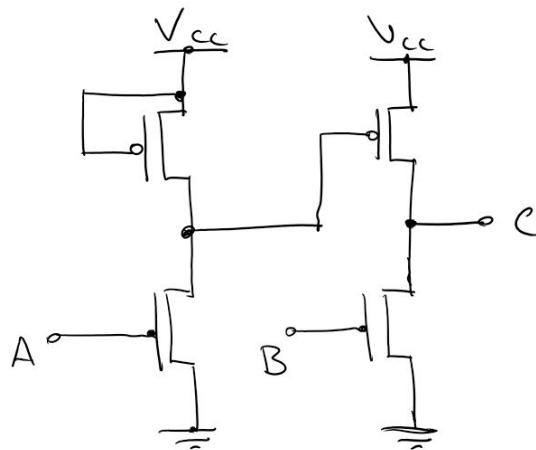

output

23. For the circuit above, what would be the output diagram if there was a capacitor placed across the output pin and the ground?

24. Draw the truth table for the following CMOS circuit:
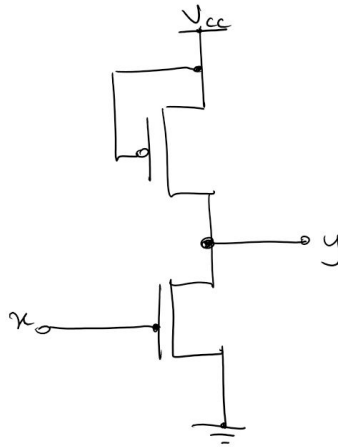
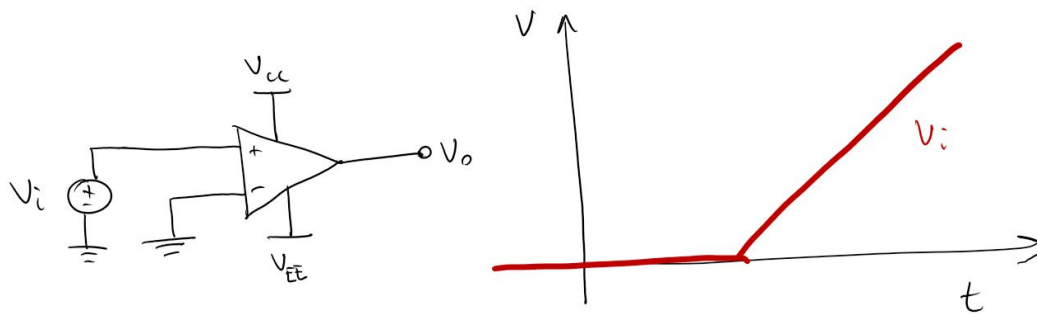25. Draw the truth table for the following CMOS circuit:

Miscellaneous

26. Imagine you were building a gaming desktop setup. In detail, outline the assumptions, reasoning and the steps you would take to do that.
27. After building a computer, you notice that when you press the power button, it does not turn on. What would be your steps to troubleshoot this problem?
28. Have you ever worked with prototyping/embedded electronics (e.g. Arduino, Raspberry Pi)? If so, what was your experience like?
29. What is DVI? What does DVI stand for? How many types of DVI are there? How can one tell them apart?
30. What is HDMI? What does HDMI stand for?
31. What is PCIe? What does it stand for? What is it used for? Give as many details as possible.
32. Looking at the graphics card below, explain what do you see (e.g. name as many components as you know):
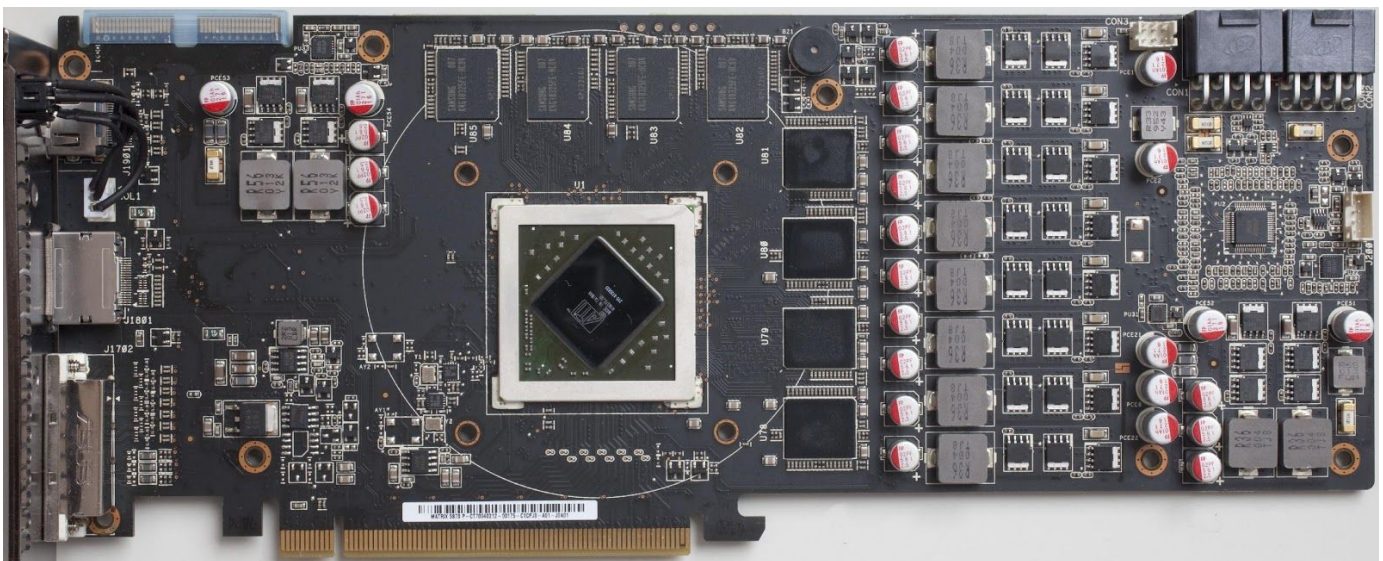
Analog

33. Draw a circuit diagram of an Ideal OPAMP. Label the diagram and explain any assumptions. Explain the operation.
34. Draw a transfer function of an ideal OPAMP. Label all valuable information.
35. Draw the output of the following ideal OPAMP considering the input on the right:

Useful Resources

** https://www.edn.com/design/analog/4371393/Understanding-the-basics-of-setup-and-hold-time

http://www.doe.carleton.ca/~len/477W2003/LectureNotes/January_13_2003_2up.pdf

http://esl.ecsdl.org/content/15/5/H157/F1.large.jpg

http://slideplayer.com/slide/6068809/18/images/14/Family+of+iD+Versus+vDS+Curves:+Enhancement-Mode+nMOSFET.jpg

https://electronics.stackexchange.com/questions/21887/difference-between-latch-and-flip-flop

https://inst.eecs.berkeley.edu/~ee42/fa01/LectNotes/42_24.pdf

https://electronics.stackexchange.com/questions/74465/how-to-reduce-mosfet-turn-off-delay