Question Bank

Lecture 1

1. What does voltage logic mean? What are the most common power supply voltages?

   Logic voltage is the voltage associate with the logic value 0 *(low)* and the logic value 1 *(high)*.

   Common power supply:

   - 5V
   - 3.3V
   - 2.5V
   - 1.8V

2. Name three passive electronic components.

   - Resistor
   - Capacitor
   - Inductance

3. Shortly describe Kirchhoff's current law (KCL).

   The sum of currents in any given node is zero.

4. Shortly describe Kirchhoff's voltage law (KVL).

   The sum of voltages in any given loop is zero.

5. What does the time constant mean in the case of an RC network? How can we calculate it?

   The time it takes for the step response to reach 1 - 1/e (63.2%) of it's final value.

   `τ = RC`

Lecture 2

6. Shortly describe Moore's law.

   The number of transistors integrated on one chip would double every 18-24 month.

7. What is planar technology?

8. Shortly describe lithography in IC design.

9. What does MFS (minimum feature size) mean?

10. How "wide" is a modern MOS transistor?

11. What does semiconductor mean?

12. Name at least two semiconductor materials.

13. What does band gap mean?

14. Draw the band structure of a conductor.

15. Draw the band structure of a semiconductor.

16. Draw the band structure of an insulator.

17. What is the most important difference between the band structure of a conductor and that of an insulator?

18. What is the conductance band?

19. What is the valence band?

20. What is the difference between an n-type and a p-type semiconductor?

21. Shortly describe the basic principle of a MOS transistor.

22. Name two types of field-effect transistor.

23. Draw the structure of the nMOS transistor.

24. What does CMOS mean?

25. What is threshold voltage?

Lecture 3

26. Draw the transfer characteristic of an inverter.

27. What does fan-out mean?

28. What does propagation delay mean?

29. What does critical path mean?

30. What is the power-delay product? Why is it so important?

31. Draw the schematic of a CMOS inverter.

32. What is static power consumption? What are the components of it?

33. What is dynamic power consumption?

34. Shortly describe the charge pumping effect.