Question bank

Technology of IT Devices

2017/2018 autumn

1. What does voltage logic mean? What are the most common power supply voltages?
2. Name three passive electronic components.
3. Shortly describe Kirchhoff's current law (KCL).
4. Shortly describe Kirchhoff's voltage law (KVL).
5. What does the time constant mean in the case of an RC network? How can we calculate it?

6. Shortly describe Moore's law.
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?

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.

35. What do PUN and PDN mean in the case of CMOS logic gates?
36. What is a CMOS transmission gate?
37. What is the main difference between latches and flipflops?
38. What is setup time of a flipflop?
39. What is hold time of a flipflop?
40. Shortly describe the operation of CMOS domino logic.

41. Name four digital design abstraction levels.
42. What does synthesis mean?
43. Name two hardware description languages.

44. What is SystemC?
45. What does functional verification mean?
46. Shortly describe the role of the testbench in digital design.
47. What does code coverage mean?
48. What is a cell library?
49. What does floorplan mean?
50. What does post layout simulation mean?
51. What are the semiconductor IPs?
52. What is Soft Core IP?
53. What is Hard Core IP?

54. How many transistors does a static RAM cell consist of?
55. How many inverters does a static RAM cell consist of?
56. Draw a dynamic RAM cell.
57. Why does DRAM require refreshing?
58. What is embedded DRAM?
59. What does CAM mean? What is the "content"?
60. What is FERAM (or FRAM)?
61. What is MRAM?
62. What does pseudo NMOS mean in the case of logic gates?
63. Name two advantages and two drawbacks of a pseudo NMOS logic gate.
64. What is mask programmed ROM?
65. What does antifuse mean?
66. Shortly describe the operation of EPROM.
67. Shortly describe the operation of EEPROM.
68. What is the main difference between EPROM and EEPROM?
69. Shortly describe the operation of FLASH ROM.
70. What is the main difference between SLC and MLC flash memory cells?
71. What are the main differences between NAND flash and NOR flash? Which one is more suitable for data storage?
72. Shortly describe the reading procedure of flash RAM.
73. Shortly describe the programming procedure of flash RAM.
74. Shortly describe the erasure procedure of flash RAM.

75. What is VNAND flash? What is the main advantage of it?

76. What does ASIC mean?
77. What are the COTS circuits?
78. What does SoC mean?
79. What does full custom ASIC mean?
80. What does semi-custom ASIC mean?
81. What does standard cell ASIC mean?
82. What does gate array ASIC mean?
83. What is CPLD?
84. What does FPGA mean?
85. List four FPGA resources.
86. What is BLE in FPGAs?
87. Name and shortly describe two FPGA special resources.

88. What are the main tasks of an I/O pad?
89. What is ESD protection? Why is it important?
90. What are the main properties of clock signals?
91. Shortly describe the role of clock signal distribution networks.
92. Name three serial communication protocols.

93. Shortly describe the operation of a transformer.
94. What are the differences between a half-wave rectifier and a full-wave rectifier?
95. What is the basic principle of a DCDC converter?
96. What is a charge pumping circuit?
97. Shortly describe the role of voltage regulation.
98. What does PFC mean?

99. What does LED mean?
100. Draw the I-V characteristic of an LED with forward voltage of 3V.
101. What is the difference between direct and indirect band gaps?
102. How is white light made with LEDs?
103. What does LASER mean?
104. What are the differences between LED and LASER?
105. Why does a power LED require special packaging?
106. What is optocoupling?