

## Interfaces

### Questions to work out at home for the test

1. Draw the block scheme of a simple computer (CPU, memory, IO devices, bus-architecture).
2. Draw the block scheme of a simple processor (bus connections, internal bus, interpretation and execution of commands, ALU, registers)
3. What do we mean by a processor being "8 bit"?
4. Is it true that you cannot calculate with 64 bit numbers on an 8 bit processor?
5. If my PC's processor has an address bus width of 32 bits, what is the largest memory (RAM) space I can address? (In a reasonable unit!)
6. What are the general differences between a microprocessor and a microcontroller?
7. List at least 4 functions (integrated peripherals) that can be commonly found in a microcontroller (and not in a normal microprocessor).
8. What would be your solution for a low speed, cheaply and simply realizable data transfer protocol between a microcontroller and a PC? What is the minimal number of wires you need for it?
9. If I want to connect multiple transmitters on a bus line (in parallel), then because of the different logic states (voltage levels) it would create a short circuit. Describe the two methods with which we can avoid this (draw!).
10. What is the "interrupt"? What is it good for? What happens when you call an interrupt?
11. What is the "stack"? Where and for what can it be used for? What are its special attributes?
12. What is the "Carry bit"? How and where is it used?
13. What does the word „random“ in RAM mean exactly?
14. What is the difference between the Neumann and Harvard processor architectures? Where are they used generally?
15. What is the purpose of "pipeline" in processors and how does it work?
16. Transform the decimal number 202 into binary and hexadecimal form, then produce the two's complement from the binary form (in 8bit number format)!
17. What is "direct memory addressing" (DMA)? What is its purpose, how does it work and where can it be found?
18. What are the differences between SRAM and DRAM?
19. What is "cache" (in PC's)? How does it work and what is it good for?
20. Describe "floating point" number format and give an example! What are its advantages-disadvantages compared to the fixed point format?
21. If a processor's instruction set and hardware doesn't contain a multiply instruction, can we still do multiplication with it? What does it have to know and what is the principle of this?
22. Describe NRZ coding using drawing of waveform.
23. What is the Manchester-code's advantage and disadvantage compared to NRZ? Draw the elemental waveforms!
24. Describe the RS232 in short! (What kind of connection, how many and what kind of devices can it connect, what connection technique does it use, what sort of addressing, is there any sort of error connection, normally for what distances and what area of use).
25. Describe I2C bus in short! (What kind of connection, how many and what kind of devices can it connect, what connection technique does it use, what sort of addressing, is there any sort of error connection, normally for what distances and what area of use).

26. Describe SPI bus in short! (What kind of connection, how many and what kind of devices can it connect, what connection technique does it use, what sort of addressing, is there any sort of error connection, normally for what distances and what area of use).
27. Describe CAN bus in short! (What kind of connection, how many and what kind of devices can it connect, what connection technique does it use, what sort of addressing, is there any sort of error connection, normally for what distances and what area of use).
28. What sort of problem can occur if I connect a switch directly (or with a pull-up resistor) to the input of a microprocessor/ microcontroller? How can we protect against such incident?
29. Can I connect a 5V digital output to a 3,3V system's input (generally)? If not, how can the connection be realized?
30. Can I connect a 3,3V digital output to a 5V system's input (generally) (will it work and why)?
31. Is it true that two computers on the world cannot have the same IPv4 address?
32. What options do I have, if I want to transmit multiple user's dataflow on one pair of wires (without a mix-up)?
33. What do the simplex, half-duplex and full-duplex channel designations mean?
34. What are the advantages and disadvantages of using for non-binary (eg. base-8) for digital data transfer?
35. What is the connection between signal to noise ratio, maximal data transfer speed and bit error rate?
36. What does net and gross bitrate mean (data transfer speed)? Why is there a difference?
37. Why is UDP faster than TCP-IP? What is it's disadvantage? Where can these be used?
38. What is the parity bit? Generate a parity bit to the end of the 0010110 binary number in the case of even parity!
39. What is "entropy" (in information theory)? What can we learn from it?
40. What does "variable length coding" mean, and where and why do we use it? What else does it need to be unambiguous?
41. What does prefix-free encoding mean, where and why do we use it?
42. What is the purpose of Huffman-coding? Describe the method in short!
43. Describe dictionary-method compression.
44. Is it true that there is an encryption method that is theoretically unbreakable? How does it work? What is the method's disadvantage in practice?
45. Describe open key encryption in short (not the equations but the algorithmic principle). For what purposes can it be used?
46. Describe the main wavelengths used in optical cables! What is the main benefit of using optical cables? How is the transmission of multiple users dataflow achieved on one cable?
47. How is the transmission of the dataflow of multiple users achieved in radio communication?
48. What is the essential correlation between the wavelengths and physical length of dipole and monopole antennas?
49. What is the principle of aperture antennas (for example a paraboloid or patch antenna)? What is the relationship between their size and their radiation characteristics?
50. How does the radio channel loss (free-space loss) depend on the distance?