**Computers and Networks**

**Questions of the final exam**

**BSc**

**Valid from 1st November 2020**

1. 1. Describe the services and protocols provided by the Internet Transport Layer.
	2. Describe the possible methods of Input / Output in operating systems and describe in detail how DMA works. Describe the methods of reading data from a hard disk and their problems. Describe the head positioning problem and the solution strategies. Describe and compare the different RAID levels.
	3. Describe the concepts and basic elements of cryptography. Talk about symmetric key cryptography in detail.
	4. Describe the static and dynamic memory allocation techniques and strategies. Describe the segmentation virtual memory allocation. Describe the paging virtual memory allocation, strategies, methods, problems and solutions. Compare the segmentation and paging virtual memory allocation.
	5. Describe Public Key Infrastructure (PKI). Detail the different elements and services.
	6. Describe what multi-programming is. Explain processes, their states and modells. Describe threads. Compare processes and threads. Describe the different scheduling methods in operating systems. Compare their different properties.
	7. Describe the ISO-OSI layered model and the TCP/IP model.
	8. Describe the deadlock problem and the different avoiding, predicting, solution techniques.
	9. What is the purpose of computer networks? Describe the division of computer networks by extension and topology. Describe the structure of the Internet.
	10. Describe the different methods for communications between processes. Describe the problems. Describe mutual exclusion and different solution techniques.
	11. Explain the concepts of IT security. Talk about threats and defence solutions.
	12. How can we raise the performance of computers (processor level)? What are the limits of our possibilities? What are todays design methods for that? (cycle length decreasing, cycle number maximization, ..) What are the parameters of instruction- and processor level parallelism? What methods are used in branch-prediction? Why is that necessary?
	13. Describe the IPv4 protocol and the IPv4 addressing scheme. Describe NAT service.
	14. Describe the *compilation* and *interpretation* methods, their steps, the differences. What are language-levels? How does interpretation work inside CPU-s? What are the abstraction layers of computer design? What are the tasks at microarchitecture level? What is the *datapath*? What controls its work? What are microinstructions? What registers are used between the datapath and the main memory (IJVM!)?
	15. Describe the functions of ARP, ICMP and DHCP protocols. Demonstrate the communication process of two hosts over the same subnet and different subnets.
	16. What kind of memory-types do you know? What are the parameters of these? What is the difference between SRAMs and DRAMs? What are their working principles? What are they typically good for? How do caches work?
	17. Describe some application layer services and protocols (WEB, DNS, FTP, electronic mail).
	18. What is the task of buses (ISA, eISA, PCI, PCIe, USB)? What are synchronous and asynchronous buses? How does the bus arbitration work?
	19. Describe passive and active elements used in computer networks.
	20. Why can transistors be the elementary components of computers? What are gates? What is the Boole-algebra? What are equivalent electric circuits?