QUESTIONS FOR THE FINAL EXAM - BSc. Eng.
INFORMATICS

I. COMMON COURSES

1. Explain random variables and their distributions, provide examples.
2. Define interval estimation, statistical significance tests.
3. What functions do digital functional blocks perform?
4. What are the methods for designing sequential asynchronous circuits, and how do they work?
5. What are the principles for performing arithmetic operations in base-p number systems?
6. How does the arithmetic of signed decimal numbers with binary coded digits work?
7. What are the data structures in a high-level programming language?
8. What is a function in a high-level programming language?
9. What does a Turing machine consist of and how is it programmed?
10. What is the structure and operation of a computer according to the von Neumann model?
11. What parameters describe the characteristics of digital integrated circuits?
12. According to what criteria are counters classified?
13. Discuss the architecture of relational databases.
14. How do we perform searches in relational databases?
15. What is database transaction management—what are transaction isolation levels and the transaction log?
16. Discuss object-relational mapping and its implementation in the Java ecosystem (JPA, Hibernate, Spring Data) or the .NET ecosystem (Entity Framework).
17. Define RESTful services. Elaborate implementation of RESTful services using Spring Boot.
18. How is a logical address translated into a physical address in systems with virtual memory?
19. How can the performance of modern microprocessors be increased?
20. How can arguments be passed to a procedure, and how is the function result returned? What are the strengths and weaknesses of each method?
21. How does vector (SIMD) computation work? How is the problem of missing comparison flags and range overflows resolved?
22. List the types and models of communication in operating systems.
23. Discuss process scheduling algorithms in operating systems.
24. Discuss how virtualization systems work in the context of virtual machine isolation.
25. Discuss time synchronization algorithms and the NTP protocol in distributed systems.
26. Discuss time complexity of algorithms and Big O notation.
27. Discuss algorithmic paradigms: divide and conquer, dynamic programming, exhaustive search, and greedy algorithms.
28. Discuss computer clusters—servers as cluster nodes; networks connecting cluster nodes.
29. Describe object-oriented programming in Java.
30. Discuss the mechanisms of exceptions, multithreading, annotations, stream processing, generic types, lambda expressions, enumerations and collections.
31. Describe metrics of parallel algorithms: worst-case computational complexity, speedup, cost of parallel computation, efficiency.
32. Discuss the following concepts: critical section, deadlock, starvation, process liveness, and process safety.
33. Define and explain the purpose of affine transformations used in computer graphics applications. List three examples of affine transformations.
34. Present the methods and technologies used to increase the speed of data access in modules and systems of main memory and mass storage.
35. Present the methods and technologies used to protect against data loss in modules and systems of main memory and mass storage.

36. List the programming languages, development environments, tools, and user interaction methods used in the design and implementation of mobile applications for iOS and Android.
37. Discuss methods for collecting, processing, and storing data in mobile applications for iOS and Android.
38. Present the operating principles, technologies and solutions used in local area networks.
39. Present the operating principles, technologies and solutions used in wide area networks.
40. Discuss the programming languages that can be used in programming industrial controllers.
41. Present the important features of industrial controllers and their role in OT/IT systems.
42. Explain the concept of Industry 4.0 and discuss related models and components.
43. Explain the communication mechanisms in industrial distributed systems and provide examples of protocols.
44. Discuss back propagation algorithm as an example of gradient-based neural network training.
45. Explain evolutionary algorithms as an example of population-based optimization methods.
46. Explain how classification algorithms work: decision tree, Random Forest, SVM, decision rules.
47. Explain how data clustering methods work: hierarchical agglomerative clustering, k-means, DBSCAN

II. COMMON COURSE FOR SPECIALIZATION

DATABASES AND SYSTEM ENGINEERING (DBSE)

1. Describe the architecture of a data warehouse and how it differs from traditional database architectures.
2. What is the ETL process, and what are its components?

COMPUTER GRAPHICS AND SOFTWARE (CGS)

1. What is the purpose of a lighting model in computer graphics? List the main classifications of models. Provide an example and characteristics of a selected lighting model.
2. What are the different ways to represent 3D shapes (models) in computer graphics applications? List their characteristics, purposes, advantages, and disadvantages.

IT MOBILE AND INDUSTRIAL SYSTEMS (IMIS)

1. Explain the concept of cyber-physical systems and provide examples for OT-class systems.
2. Discuss the issues of cooperation between physical and digital components.