Problem Group A

Tools of computer science

1. Sections in documents - definition, section formatting elements and their characteristics.
2. Style - definition, elements of style and scope of application.
3. Mail merge - purpose and scope of application.
4. Spreadsheets - purpose, scope and fields of application.
5. Cell address in spreadsheets - types of addresses, and examples of applications.
6. Types of charts and rules for selecting chart types.
7. The "Goal Seek" feature - purpose and examples of application.
8. Solvers in spreadsheets - definition, purpose and examples of application.
9. Pivot tables - definition, purpose and examples of application.
10. Principles of creating a proper presentation.

Programming

11. Principles of Structured Programming. Composition and elements of the program.
12. Conditional statements and switch statements.
13. The concept of iteration and its implementation using iteration statements.
14. Ways of error handling. Exception Handling Statements. Free statement.
15. Procedures, functions, modules - the concept, structure, application.
16. Files - concept, types, processing scheme.
17. The idea of object-oriented programming. Structure of a Programme Properties of objectoriented programming
18. Class and object - the concept, definition, application.
19. Encapsulation - the concept, method of implementation.
20. Inheritance and polymorphism - the concept, method of implementation.
21. Inheritance and method overloading.

Operating systems

22. The basic tasks of an operating system.
23. The concept of kernel of the operating system and its tasks.
24. Tasks and problems of memory management by operating systems.
25. Tasks and problems of input-output management by operating systems.
26. The organization and planning of resource allocation in operating systems.
27. The terms "multiuser system" and "multipurpose system" as exemplified by: DOS, Windows, and Unix (Linux) systems.
28. What is the difference between Unix file system and Windows file system organization?

29. Examples of co-existence (and cooperation) of computers with installed various operating systems (Windows, Linux, Unix) within a network of one company
30. Function and importance of virtual memory.

Problem Group B

Computer system architecture

1. Generations of computers and the concept of supercomputer - characteristics and exemplary constructions.
2. The classic concept of von Neumann computer.
3. Basic methods and problems of encoding numeric information.
4. Basic methods and problems of performing arithmetic operations on fixed-point and floatingpoint number representation.
5. General structure of microcomputer system.
6. Hardware-dependent programming language - general form of instruction and basic types of instructions.
7. The hierarchy of computer memory and characteristics of each type of memory.
8. Characteristics of lntel 80x86 processor family with a special emphasis on the Pentium processor architecture.
9. The impact of computer system architecture on the speed of the system.
10. Multiprocessor computer systems. Characterize the basic concurrent systems architecture.

Algorithms and Data Structures

11. What do we call an algorithm? List and discuss the basic properties of a computer algorithm. Illustrate your answer with an example of an algorithm solving quadratic polynomial in the field of real numbers.
12. Name the forms of representation of computer algorithms and discuss basic types of such algorithms. Illustrate your answer with examples.
13. The concept of computational complexity of an algorithm. Discuss its components.
14. What do we call a time complexity of an algorithm? Name the basic time complexity and characterize the corresponding to them classes of algorithms.
15. Definition of recursive algorithm. The basic features of recursive algorithms - as an illustration use the algorithm of factorial function (f (n) = n!).
16. List structures. Name types of lists and describe the properties of a stack and queue.
17. Define the problem of set sorting. Specify the types and kinds of sorting algorithms.
18. Quick sorting method (quicksort).
19. Definition and use of hash functions.
20. Definition and methods of representing undirected graphs. Draw an undirected graph and on this example discuss the basic characteristics of such graphs.

Computer networks

21. Differences (and the basic advantages and disadvantages) between "peer-to-peer" networks and client/server networks.
22. The OSI model and the benefits of its implementation.
23. Name and discuss the benefits of using switches instead of hubs within a local area network (LAN).
24. Components of the LAN and WAN networks.
25. Draw and discuss the model of protocol family TCP / IP. Give examples of protocols (standards) of successive layers. Compare the TCP / IP model with the OSI model.

Introduction to Computer Science

26. Explain the purpose, design and the concept of a Turing machine.
27. Discuss process of programming, compilation, and execution of a program.
28. Classify generations of programming languages. Provide examples.
29. Name and characterize programming techniques.
30. Explain the concept of the operating system as a virtual machine and characterize its tasks.

Problem Group C

Software engineering

1. What is the life cycle of a computer system? Name and characterize various cycles.
2. What is a feasibility study of the system? What is its outcome?
3. What is covered by a system analysis? What is its outcome?
4. What does the system requirements specification refer to? What is its outcome?
5. What is the testing phase of a system? What is its outcome?
6. Describe the spiral model of a computer system life cycle and characterize its main stages.
7. Describe the (cascading) waterfall model of a computer system life cycle and characterize its main stages.
8. What is the context diagram of a computer system used for? What does it include?
9. Describe the concepts of conceptual model and implementation model. Identify and explain the differences between them.
10. What is a DFD? What is it used for?
11. What is a 0 level DFD (DFD0) and what is it used for?
12. What is an entity? What are the rules of entity identification?
13. What are the types of relationships between entities? Give examples.
14. Describe the process of mapping entities to database tables

15. Characterize the process of computer system testing: its objective, levels, methods, test completion criterion.

IT Project Management

16. Characterize the concept of a project.
17. What is a project schedule and what are the criteria for its creating?
18. Explain the term "learning curve".
19. What types of resources are known to you? Discuss the problem of their allocation.
20. What is a critical path? How is it calculated and what is its significance?
21. What is the effect of expenditure scale? Give examples and reasons for IT projects.
22. Draw an organizational chart of a project and characterize the roles of its participants.
23. What is control point of project and what role does it play?
24. What is the interdependence between the duration and the size of resources allocated to a specific task?
25. What conflicts may occur in resources allocation? Characterise each of them.
26. What are the rules for work decomposition in the Work breakdown structure (WBS)?
27. What are the types of network models?
28. What conflicts may occur in resources allocation? Characterise each of them
29. What are the methods of project implementation tracking and comparing them with the plans?
30. What is a project calendar, and what are task and resource calendars?

Problem Group D

Database systems

1. A database management system - functions.
2. Architecture of the database system - levels of data description.
3. A DML language in databases - application, examples of commands.
4. A DDL language in databases - application, examples of commands.
5. Implementation database models - types and their characteristics.
6. Characteristics of a database relational model.
7. Relationships between tables - types, characteristics of the relationships, examples.
8. Data integrity - types, ways to ensure the integrity of databases.
9. Transaction - definition, characteristics of the transaction.
10. Databases keys - definition, types, area of implementation.

Management information systems:

11. What is the Management Information System? Name its main tasks and position in a company.
12. What are the requirements for management information systems? Describe their characteristics on the example of a wholesale of computer hardware.
13. What is Functional Area Information System? Give examples of such systems in a manufacturing company and provide their brief description.
14. Give the most important tasks and describe the scheme of technical preparation production system (TPP).
15. Give the most important tasks and describe the scheme of materials management system in a production company.
16. Name the basic components of a financial and accounting system and its role in business management.
17. Name the basic features of Integrated Information Systems used in business management and describe its work principles.
18. What is MRP II system? Describe the concepts and areas of operation of such systems.
19. Discuss the evolution of MRP-class systems.
20. What is ERP-class system? Describe the concept and the requirements for such systems.

Security of IT systems

21. Name the basic characteristics of company information that should be protected. Explain the meaning of each of them.
22. Explain the concepts: identification, authentication, authorization, and accountability.
23. What is a business plan for information security? What are the stages of its development?
24. Classify threats to IT systems. Provide examples.

25. Explain the concept of access control, name its security levels.
26. Classify types of malware and describe methods of protection against it.
27. Characterize the concept of the system threat window and methods of minimalizing it.
28. Describe mechanisms for protecting data against loss. Characterize the rules of their implementation
29. What is data encryption and decryption? What are the basic encryption methods?
30. Explain the essence and implementation of an electronic signature.

S2 – Mobile Technologies

IOS System

1. What is needed for IOS program development?
2. What does Xcode do?
3. Describe the Model-View-Controller design pattern used for iOS application development.
4. List the next phases of designing an application for iOS.
5. Basic data types used in applications in the Objective-C language.
6. Distinguish between the concepts of class and object, used in the Objective-C language.
7. Provide the syntax to evoke the method for the class or object in Objective-C.
8. In which mobile devices has the IOS operating system been used?
9. What is IOS multitasking?
10. How can a user manage the file system in IOS?

Android System

11. Describe the concepts of Activity and Intention in terms of creating an application for the Android operating system.
12. Explain the meaning and application of the AndroidManifest.xml file.
13. Explain the concept of Content Providers and describe its use in programming applications for the Android operating system.
14. Explain the term Service in the context of the Android operating system.
15. Explain the concept of Dalvik VM and describe its activities in the Android operating system.
16. Describe the concept and explain the operation of the Android Sandbox mechanism, isolation and security of applications in the Android operating system.
17. List the five basic layers that make up the Android operating system. Describe the one you choose.
18. Explain the concept of Android Framework, give its application in the area of application programming for the Android operating system.

19. List at least three examples of services included in the Android Framework that manage Android Managers.
20. Explain the concept of Android Debugging Bridge and the importance of creating applications for the Android operating system.

Mobile databases, business applications of mobile technologies, creating web applications for mobile devices

21. List the advantages, disadvantages and barriers of the use of mobile databases.
22. List exemplary platforms (environments) for the implementation of mobile databases.
23. List and characterize the methods of collecting data in mobile databases.
24. Characterize the concept of mobile business intelligence and its importance in modern business.
25. Characterize the geolocation mechanism in HTML5 applications.
26. List and briefly characterize local HTML5 data stores.
27. What is a manifest file and what is it for in HTML5 applications.
28. List and characterize new types of HTML5 form fields known by you.
29. What is form validation and what are the methods of its implementation in HTML5?
30. List the haptic events that can be maintained in JavaScript. Give an example of handling the selected event.

S3 – Databases

Relational Databases

1. Creating database applications – concept, capabilities, implementation methods.
2. Database system – definition of the term, system components, and relationships between them.
3. Database Management System (DBMS) – functions.
4. Explain the essence of data abstraction, integrity, consistency, and security.
5. Database system architecture – levels of data description.
6. Characteristics of a relational database.
7. Basic operations on tables in the relational data model.
8. Entity-relationship diagram – components and examples.
9. Implementation models of databases – types and their characteristics.
10. Relationships between tables – types, characteristics, and examples.

Database Programming

11. DML (Data Manipulation Language) in databases – usage and example statements.
12. DDL (Data Definition Language) in databases – usage and example statements.

13. Transaction – definition and characteristics of a transaction.
14. Sorting and indexing data – goals, implementation methods, and areas of application.
15. Types of locks in databases and their compatibility.
16. List and characterize isolation levels in databases.
17. List and describe the properties of databases that ensure correct transaction processing (ACID).
18. Indexes in databases – purpose and application.
19. Database languages – concept, usage, examples.
20. Methods for automatic insertion of primary key values.

Database Design

1. Data integrity – types and methods of ensuring integrity in databases.
2. Failures in database systems – types and methods of restoring consistent database states.
3. Database normalization – definition, features, and purpose of use.
4. Keys in databases – definition, types, and areas of application.
5. Responsibilities of a database administrator.
6. User interface architecture – types and characteristics.
7. Graphical User Interface (GUI) – definition and features of a well-designed interface.
8. Data representation in forms – methods of data mapping.
9. Non-relational databases – concept, usage, examples.
10. Object-relational mapping – concept, advantages and disadvantage.

S6 – Cybersecurity and computer forensics

1. Mobile networks 2G – 5G (types, architectures, radio interface, transmission techniques) and critical communication networks.
2. Cloud computing: models, services, characteristic features.
3. Wireless networks WLAN (802.11xx): operating principles, radio interface parameters, transmission techniques.
4. Present the idea of DoS attacks and briefly characterize their types.
5. Security of resources and data in distributed systems.
6. Discuss security mechanisms used in Wi-Fi wireless networks.
7. Substitution ciphers (simple and polyalphabetic).
8. Methods for securing network devices: authentication, authorization, firewalls.
9. Asymmetric algorithms. RSA cipher.
10. Computer networks: structure, protocols, layered model, transmission media.