**Application developer specialization**

**Questions of the final exam**

**BSc**

**Valid from 1st November 2020**

The following topics will be questioned in the form of a conversation through a practical example!

1. Relational database design methods.

* What are the main features and components of relational data models? What rules can we use to map a semantic model into a relational model?
* Define functional dependence! Describe the Armstrong axioms. Key, super key concept. What normal forms do you know? Normalization steps.
* primary key, foreign key, unique key, index
* handling of index, btree structure

1. Describe the methods of relational database management with transaction management and SQL statements!

* What is the transaction, what is its significance? What are the ACID principles? What instructions can we use to signal the start and end of a transaction? What is the essence of concurrent operation, what locks can we use to eliminate problems arising from concurrent execution? What levels of isolation can we define?
* Introduce the SQL language. Describe the DDL and DML instructions. What kind of operations can we use? Explain the difference between DDL and DML in terms of transaction management
* What data types are supported by database management systems and SQL? SQL programming: Stored Procedures, User Defined Functions, significance and use of triggers.

1. Describe the types of version control systems and name some version control programs!

* Explain the difference between distributed and centralized version control.
* Demonstrate the essence of the following concepts with practical examples: branch, tag, commit, merge, rebase, fetch. Describe the process of Git Flow.
* Describe testing capabilities and life-cycle process management for source code.

1. Describe the essence of layered application development, list the advantages, which layers you can distinguish, which one is responsible for what?

* Presents the structure of an example application

1. Describe the types of web services, what their format, essence and means are.

* What public web services do you know?
* Describe the essence of SOA and its principles
* What is the difference between REST and RPC?

1. Describe the concept and principles of object-oriented programming

* Describe the operators used in relation to object orientation
* SOLID principles
* What relations are possible between classes and objects? Detail them!
* Please compare Java, C# and JavaScript languages.

1. Describe the operation and structure of server-side applications. (You can choose from Enterprise Java, Spring, NodeJS, or ASP.NET technologies.)

* Describe the thread management, its critical points and their solution, the essence of Reflection and Annotation!
* Describe the areas of application of the above.
* What frameworks are built on the above apparatus and in what way.

1. Describe the development models of large software systems! (Waterfall, evolutionary, iterative, spiral model, RUP)
   * What characterizes agile methodologies? What are the principles of agile methods? What is Scrum?
2. Describe the design and implementation concepts related to the use of frameworks.

* Describe the Dependency Injection programming design pattern, what scopes do you know?
* What is an IOC container, what is its working principle?
* Introduce the Spring framework. What modules do you know?

1. Describe the principles of authentication management security, per layers, for software development!

* Explain the essence of SQL injection, what methods do you know to avoid it?
* Describe network data security challenges and solutions for application development. Demonstrate the use of AES, RSA, DH algorithms through examples, e.g. certificate request, password encryption, etc. for web service.
* Demonstrate authentication management with the server-side system of your choice.