Topics of the Final Examination

Computer Science and Information Technology MSc Course

Specialization: Information Systems

Basic topics

1. First order logical languages, term and formulae. Interpretation os first order languages, valuation of the variables.
2. Logical laws and contradictions. Normal forms of logical formulae.
3. Definition of Turing machine and its time- and space complexity. The Church's Thesis. The space-time theorem. The notion of witness and the witness theorem.
4. Languages and automata (grammar, language, the Chomsky hierarchy, the definition of automata and their relation to language classes).
5. Statistical variable, sample. Statistical estimates.
6. Analysis of hypothesis: parametric and non-parametric tests. Linear regression, regression-diagnostic.
7. Sorting: Heapsort, Quicksort, Counting sort, Bucket sort.
8. Data structures: elementary data structures, binary search trees, red-black trees, B-trees, piles.
9. The relational data model. Functional dependencies, normalization, normal forms. ER models, OO and OR models.
10. Standards. Modeling of information systems (environmental, behavioral, data, and object models).

Topics of the specialization: Information System

1. Steps of the data mining process. Comparing data mining techniques: statistical and graphical tools. Sampling, learning, validating and test datasets. Decision trees. Neural networks. Nearest neighbour method. Association rules. Clustering.
2. Predictive modeling. Learning algorithms. Text mining: preprocessing, latent semantic indexing, EM clustering. Web-mining. Searching on the Web.
3. Backup, restore handling. DSM, DAC, Mandatory Security Model, Multilevel Secure. Handling and managing integrities. Consistency control.
4. Basic standards: UML 2, MOF, XML, XMI, XQuery, XPath, CWM. Interface-based design. Web service technologies. Metamodels and metaprogramming. Life cycle of Web applications. Designing Web applications. Ontologies.
5. Architecture models (static structure, dynamic process, interface, connectivity, distributed model). Architectural designs. Client-server, layered, distributed object, component architectures. Business systems architectures. Reference architectures. Services and service-oriented architectures.
6. Main features and key elements (processes) of the Information Technology Infrastructure Library (ITIL). Service support processes: configuration management and CMDB, incident management, problem management, change management, release management, availability management.
7. Quality concepts: philosophic, social, producer & customer approach. Measuring the quality. Basic notions of quality assurance. Software quality standards.
8. Software metrics: predictor and corrector metrics, internal and external characteristics. Quality value of product and design. Program quality. Software reliability metrics. software testing.
9. Organizational structure and management of companies. Organizational models, organizational forms, life cycle of organizations. Executive information systems, electronic business management, controlling, decision-making.
10. Project management methodologies, project cycle, projektmodell, project types. Project planning, estimating, determination, timing and documentation. Roles in the project. Requirements, change and risk management. Resource management, cost management, multi-project management. Tracking projects, performance measurement and quality assurance. Completion of projects, warranty, maintenance, tracking, customer service.