Topics for the Computer Science Bachelor Graduation Examination
July and September 2019

Computer Science Specialization

Part 1. Algorithms and Programming

1. Search (sequential and binary), merging, sorting (selection sort, bubble sort, insertion sort, merge sort, quicksort). The backtracking method.
2. OOP concepts in programming languages (Python, C++, Java, C#): class and object, members of a class and access modifiers, constructors and destructors.
3. Derived classes and inheritance. Method overriding. Polymorphism. Dynamic binding. Abstract classes and interfaces.
4. Class diagrams in UML. Relations between classes.
5. Lists, Maps. Specification of typical operations (without implementations)
6. Identify data structures and data types suitable (efficient) for solving problems (only the data structures specified at 5.). The use of existing libraries for these structures (Python, Java, C++, C#).

Part 2. Databases

1. Relational databases. First three normal forms of a relation.
2. Querying databases using relational algebra operators.
3. Querying relational databases using SQL (Select).

Part 3. Operating systems

1. The structure of UNIX file systems
2. UNIX processes: creation, and the fork, exec, exit, wait system calls. Pipe and FIFO communication
3. Unix Shell Programming
   a. Basic concepts: variables, control structures (if/then/elif/else/fi, for/done, while/do/done, shift, break, continue), predefined variables ($0, $1,..., $9, $*, $@, $?), I/O redirections (|, >, >>, <, 2>, 2>>, 2>&1, the /dev/null file, back-quotes ``)
   b. Regular expressions
   c. Basic commands (functioning and the effect of the specified arguments): cat, chmod (-R), cp (-r), cut (-d,-f), echo, expr, file, find (-name,-type), grep (-i,-q,-v), head (-n), ls (-l), mkdir (-p), mv, ps (-e,-f), pwd, read (-p), rm (-f,-r), sed (only the commands d,s,y), sleep, sort (-n,-r), tail (-n), test (numerical, string and file operators), true, uniq (-c), wc (-c,-l,-w), who