

Concurrency and prallel programming

Final written exam

Date: December, 21 2017

Time: 14:00-16:00

Number of pages: (including front page)

Number of questions: 25 (Real exam)

Maximum number of point to earn: 25% of the final grade

At each question is stated how many points it is worth

BEFORE YOU START

- **Wait** until you are instructed to open the booklet.
- Check if your version of the exam is complete.
- Write down **your name, student ID number**, and if applicable the **version number** of the exam **on each sheet** that you hand in. Also **number the pages**.
- Your **mobile phone** has to be switched off and be put in your coat or bag. Your **coat and bag** should be under your table.
- **Tools allowed:** ruler, (graphic) calculator, books, articles, tables, none etc..

PRACTICAL MATTERS

- The first 30 minutes and the last 15 minutes you are not allowed to leave the room, not even to visit the toilet.
 - You are obliged to identify yourself at the request of the examiner (or his representative) with a proof of your enrollment or a valid ID.
 - During the examination it is not permitted to visit the toilet, unless the invigilator gives permission to do so.
 - 15 minutes before the end, you will be warned that the time to hand in is approaching.
 - If applicable, please fill out the evaluation form at the end of the exam.
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A. Computer Architecture

1. Gustafson's law describes maximum speedup when
 - a. Allowing to scale the problem size
 - b. Making use of heterogeneous core types
 - c. Ignoring the sequential fraction of applications
 - d. Taking into account communication latencies

B. Parallel Computer Architectures: Multi-core processors / Multicore Scaling / Memory organization / Communication Architectures

2. Select the true statements:
 - a. A superscalar processor executes all instructions sequentially.
 - b. A superscalar processor allows parallel execution of instructions when there are no dependencies.
 - c. A superscalar processor performs instruction scheduling in hardware.
 - d. A superscalar processor requires the compiler to identify parallelism.

C. OpenMP/PThread/MPI

3. Synchronous communication implies Existence of
 - a. handshake protocol that support the communication
 - b. a buffering system to keep the data until it's picked up by the receiver
 - c. synchronization barriers that insure the synchronization
 - d. non blocking operations that implement the synchronization

D. Big Data platforms (MapReduce/Spark)

4. In Spark **in-memory** refer to the fact that spark
 - a. primarily relies on main memory for computer data storage
 - b. works only with on main memory for computer data storage.
 - c. works only with on disk for computer data storage
 - d. does not require data management for disk

E. Performance and GPU programming (CUDA)

5. For an NVIDIA GPU:
 - a. If a thread block has multiple warps, all warps are executed by the same SM.
 - b. A thread block never has multiple warps.
 - c. All the threads in a block run in lockstep.
 - d. In an if statement, all the threads in a block have to execute both branches (i.e., the "then" and the "else").

F. Other Topics (SOA, Grid, Cloud, Guest lecture)