Försättsblad till skriftlig

tentamen vid Linköpings Universitet

Datum för tentamen	2011-08-24
Sal	TER2
Tid	08-12
Kurskod	TDTS10
Provkod	TEN2
Kursnamn/benämning	Datorarkitektur
Institution	IDA
Antal uppgifter som ingår i tentamen	4
Antal sidor på tentamen (inkl. försättsbladet)	4
Jour/Kursansvarig	Erik Larsson
Telefon under skrivtid	013-286619, 0709-656619
Besöker salen ca kl.	9 och 11
Kursadministratör (namn + tfnnr + mailadress)	Madeleine Häger
Tillåtna hjälpmedel	Inga
Övrigt (exempel när resultat kan ses på webben, betygsgränser, visning, övriga salar tentan går i m.m.)	10 arbetsdagar efter tentamen

Linköping University
Department of Computer Science
Erik Larsson

August 21, 2011

Exam

Computer Architecture

TDTS10

August 24, 2011 - 08:00-12:00

Jour: Erik Larsson(0709-656619, 013-286619)

Hjälpmedel/Admitted material:

- Engelsk ordbok
- Dictionary from English to your native language

General instructions:

- This exam has 4 assignments and 3 pages, including this one.
- Read all assignments carefully and completely before you begin.
- Use a new sheet for each assignment.
- You may answer in either English or Swedish.
- Write clearly. Unreadable text will be ignored.
- Be precise in your statements. Unprecise formulations may lead to a reduction of points.
- Motivate clearly all statements and reasoning.
- Explain calculations and solution procedures.
- The assignments are not ordered according to difficulty.
- The exam is designed for 40 points.
- Grading: U, 3, 4, 5. The preliminary threshold for passing is 22 points.

- For ECTS, LiU make use of: 5=A, 4=B, 3=C, and UK=Fx.

1. Execution (10 points)

   - What would the program counter, the zero status register, R1 and R2 contain after execution of the program below?

     ```
     Address          Instruction/Data
     0                LOAD R2, #10
     1                LOAD R1, #0
     2                ADD  R1,(R2)
     3                ADD R1, R2
     4                BR  6
     5                MUL R2, R1
     6                HLT
     7                ADD R1, R2
     8                SUB R2, #1
     9                HLT
     10               4
     11               5
     12               8
     ```

     ```
     The instructions are:
         LOAD=load, SUB=subtraction,
         ADD=addition, BR=unconditional branch,
         HLT=halt
         numbers/data are given in decimal numbers
     ```

   - For the program above, what is needed to do in order to execute the program on a computer?

   - For the program above, is it executing on a RISC or a CISC machine?

2. Processor Design (10 points)

   - Detail how a separate date-cache and instruction-cache impacts the performance in a pipeline.

   - Detail (compare) RISC and CISC

   - Explain how to use a stack to enable procedure calls

   - Explain how to use a large register file to enable procedure calls

3. Memory System (10 points)

   - What is paging? And how is logic and physical addresses related?

   - What is a page fault? Detail what happens at a page fault.

   - Discuss which parameters impact the design when organizing data on a hard disk.

- Which are the typical steps in the memory hierarchy?
- What does "locality of reference" mean (for memory systems)?

4. Operating system (10 points)

- A process may be in different states (such as running); what is the reason?
- What is time sharing used for?
- What is a context switch?
- What is a process control block and what is it used for in general and in particular at a context switch?