LINKÖPINGS TEKNISKA HÖGSKOLA
Institutionen för datavetenskap
Petru Eles

Tentamen i kursen

Datorarkitektur - TDDI03

2015-04-07, kl. 14-18

Hjälpmedel:

Engelsk ordbok.

Supporting material:

English dictionary.

Poänggränser:

Maximal poäng är 40.
För godkänt krävs sammanlagt
21 poäng.

Points:

Maximum points: 40.
In order to pass the exam you need a
total of minimum 21 points.

Jourhavande lärare:

Unmesh Bordoloi, tel. 013-28 5628

Good luck !!!

1.
a)   Why do we need special *write strategies* for cache memories?
b). We have discussed three write strategies: *write-through*, *write through with buffered write*, and *copy back*. How do they work? Which are their advantages and disadvantages?

(3p)

2.   Define the three types of pipeline hazards. Give an example for each.

(3p)

3.   Consider a pipelined processor with k pipeline stages.
a)   What is the theoretical acceleration (ignoring overheads) for a sequence of n instructions, compared to a similar but non-pipelined processor? Show how you obtain the formula!
b)   What is the acceleration of a sequence of 20 instructions if the number of pipeline stages is 5?
c)   What is the acceleration for an infinitely long sequence if the number of pipeline stages is 5?

(3p)

4.   Branch history table: what does it contain and how is it used?

(2p)

5.   Enumerate five of the main characteristics of RISC architectures.

(2p)

6.   Dynamic branch prediction with a two-bit scheme. How does it work?
     Illustrate with the case of a loop like the one below. Compare with one-bit prediction.

           - - - - - - - - - - - - - - - -
     LOOP - - - - - - - - - - - - - - - -
           - - - - - - - - - - - - - - - -
           BNZ   LOOP
           - - - - - - - - - - - - - - - -

(3p)

7.
a) What is the role of the page table in a virtual memory system? What data does it store?
b) The page table is very large, usually too large to be stored in main memory. Such a large size, at the same time, makes access to the page table very slow. How is this solved in current microprocessor architectures.

(3p)

8.
a) What is a superscalar architecture?
b) Draw a block-diagram of a superscalar unit.

(3p)

9.
a) Which are the types of data dependencies that have to be considered with an out-of-order superscalar? Give an example for each.
b) Why do we call them "true" and "artificial", respectively?
c) What can be solved by register renamimg? Give an example.

(3p)

10. Compare VLIW architectures with superscalar architectures:
a) Show similarities and differences.
b) Show the advantages and disadvantages of the two approaches.
c) Why is a superscalar consuming more power, compared to a VLIW computer?

(4p)

11. What is trace scheduling? How does it work (remember the three steps)? Why is it important with VLIW architectures?

(3p)

12.
a) What is branch predication (like in the Itanium architecture)?
b) Compare with ordinary branch prediction.

(3p)

13.
a) What is hardware multithreading?
b) Why do multithreaded processors provide higher performance?
c) We have described three approaches to multithreading: interleaved, blocked, and simultaneous; what is the main characteristic of each of them?

(3p)

14. What is a vector processor? Draw a block diagram.
     What is the basic difference between array processors and vector processors?

(2p)