Försättsblad till skriftlig tentamen vid Linköpings universitet

Datum för tentamen	2019-04-24
Sal (1)	T1(14)
Tid	8-12
Utb. kod	TDTS10
Modul	TEN2
Utb. kodnamn/benämning **Modulnamn/benämning**	Datorarkitektur Skriftlig tentam
Institution	IDA
Antal uppgifter som ingår i tentamen	14
Jour/Kursansvarig Ange vem som besöker salen	Zebo Peng
Telefon under skrivtiden	282067
Besöker salen ca klockan	10:00
Kursadministratör/kontaktperson (namn + tfnr + mailaddress)	Veronica Kindeland Gunnarsson 013-28 56 34 veronica.kindeland.gunnarsson@liu.se
Tillåtna hjälpmedel	Engelsk ordbok
Övrigt	
Antal exemplar i påsen	

Linköpings universitet
Institutionen för datavetenskap (IDA)
Zebo Peng

Tentamen i kursen
TDTS10 Datorarkitektur

Examination of the course
TDTS10 Computer Architecture

2019-04-24, 8:00-12:00

Hjälpmedel:

- Engelsk ordbok.

Poänggränser:

Maximal poäng är 40.
För godkänt krävs 20 poäng;
för betyg 4 krävs 27 poäng; och
för betyg 5 krävs 33 poäng.

Supporting material:

English dictionary.

Points:

Maximum points for the exam are 40.
You need 20 points to pass the exam;
for grade 4, 27 points are needed; and
for grade 5, 33 points are needed.

Jourhavande lärare (Teacher on duty)

Zebo Peng, tel. 013-28 2067

Note: You can give the answers in English or Swedish.

1 What are the von Neumann architecture principles? What are the main advantages of the von Neumann architecture?

(2 p)

2. a) What does it by mean by a memory of direct access type? What are the main features of such a memory.

b) Give an example of a direct access memory.

c) Can a memory of direct access type be used as the main memory of a computer system? Why?

(3 p)

3. a) What is the basic idea of associative mapping for cache organization? What are the advantages and disadvantages of the associative mapping organization, as compared with the direct mapping organization?

b) Why is the fully associative cache organization seldom used in practical computers? Which cache organization is commonly used? Why?

(3 p)

4. Assume that your computer has 4 GB main memory space, and your friend has just bought a computer game that needs 8 GB memory space to store. Your friend says that you can't run his game on your computer, since it can't even store the game in its main memory. What would you say to your friend? (Hint: You should answer the question of if your computer can run this game or not, and describe the mechanism that is involved in order to justify your answer.)

(3 p)

5. a) What does it mean by interrupt-driven I/O? What are the advantages and disadvantages of this technique?

b) Define the concept of multiple interrupts? What are the two main approaches used to handle multiple interrupts?

(3 p)

6. a) What does it mean by immediate addressing? Why is it useful to have this addressing mode?

b) Give an example to illustrate how immediate addressing can be used.

(3 p)

Note: You can give the answers in English or Swedish.

7. a) What is a data hazard in a pipelined unit? Illustrate this problem by an example and show how penalties are produced (consider a 6-stage pipeline as an example).

   b) How can this penalty be reduced with the forwarding (bypassing) technique? Draw figures to illustrate the pipelined executions without and with forwarding.

   (3 p)

8. A computer has an instruction pipeline with five pipeline stages. As a designer, you are asked to consider the possibility of increasing the number of pipeline stages of this computer in order to improve its performance. It turns out that one of the stages can't be divided into two or several shorter stages. Does it make sense to divide the other four stages so that the number of stages increased? Why?

   (3 p)

9. a) Discuss how the bimodal prediction technique work for branch prediction.

   b) Why does the bimodal prediction technique give better performance than the one-bit prediction method? Give an concrete example to support your argument.

   (3 p)

10. A superscalar makes use of instruction-level parallelism to improve the performance of instruction execution.

    a) How is this parallelism detected in a superscalar computer?

    b) Is this parallelism detection done by hardware or software?

    c) What mechanism is used to increase the parallelism in a superscalar architecture?

    (3 p)

11. Describe Flynn's classification of computers. Give briefly the definition of each alternative architecture class and an example of each class. Draw a block diagram to illustrate each architecture example you have given.

    (3 p)

Note: You can give the answers in English or Swedish.

12. What are the basic features of CISC and RISC computers, respectively? Discuss the main differences between the RISC and CISC computers, and the arguments for each of these two different computers.

(3 p)

13. The development of the RISC architectures is based on certain characteristics of program execution.

a) What are the characteristics that are related to procedure calls and returns?

b) What is the mechanism used in a RISC architecture to make procedure calls and returns efficient? How does this mechanism work?

(3 p)

14. Define and discuss the main features of a cluster computer system. What are the advantages of having such a system?

(2 p)