

**(Distans)Tentamen i kursen**

**Datorarkitektur - TDDI03**

**2020-08-21, kl. 14-17**

**Hjälpmedel:**

Engelsk ordbok.  
Föreläsningsmaterial

**Supporting material:**

English dictionary.  
Lecture slides

**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.

**During the exam Petru will be available at: [petru.eles@liu.se](mailto:petru.eles@liu.se)**

**Good luck !!!**

## Read carefully!

You have now got the exam subjects. I have sent them out at 13:45. You can now start and work. **You will have to send back the exam to me, by email (to [petru.eles@liu.se](mailto:petru.eles@liu.se)), latest at 17:00!** (The students who have officially approved extended time will have to send back their exam latest 18:00). **Indicate on the exam your name and person number!**

During the exam you are allowed to use the lecture notes from the course and an English dictionary. You are not allowed to use any other material, physical or via phone, internet, etc.

You are not allowed to interact on any topic related to the exam with any person directly, or by phone, internet, etc. An exception is interaction by email with me, in case you have any question related to the exam subjects.

You can send me back the exam as a Word or PDF document. You might have to draw figures or do some handwriting. In this case you can use scan/camera and send me back the file(s) together with the rest of the exam.

Since this is a remote exam with access to the lecture notes, the subjects are somewhat different from those with previous exams. You are asked to elaborate more on the subjects instead of just reproducing what is written in the lecture notes. You have to demonstrate your understanding of the issues and to make personal considerations. It does not help to just reproduce the lecture notes! If you follow the rules, it is also not possible that two of you give answers that are very similar.

The exams will be graded, as usual: U, 3, 4, 5.

**You are required to sign and send back (scan/photo), together with the exam, a text with the following solemn declaration (signature should be by hand!):**

.....

I hereby solemnly declare that during the TDDI03 exam, August 21st 2020, I did not use any other material than an English dictionary and the lecture notes given with the course. I did not consult any other material, physical or via phone, internet, etc.

During the exam I did not interact on any topic related to the exam with any person directly, or by phone, internet, etc. An exception is email with the course examiner.

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**Du kan skriva på svenska eller engelska!**

1. Why do we need a memory hierarchy instead of just a simple one level memory? Why and how does such a hierarchy work? What does it bring? Discuss!  
(4p)
  
2. Compare the three mapping strategies we have studied for cache memories: consider their basic working principle, pros and cons. Discuss.  
(4p)
  
3. Virtual and physical address: What is the difference? How is the translation from one to the other performed? Who is doing this translation?  
(4p)
  
4. We have a code of 1000 instructions and a pipelined processor with 10 stages. What is the ideal acceleration achieved? What is the ideal acceleration with 20 stages? What is the ideal acceleration with 100 stages? So, should processors have 100 pipeline stages or even more? Justify your answer. Discuss.  
(4p)
  
5. Why is good branch prediction particularly important with superscalars? Think at the instruction window and how you can fill it up. Discuss, elaborate.  
(4p)
  
6. Data dependencies. Give an example for each kind (example different from those in the lecture notes). Why are some of them not "true"? Discuss. Which of the dependencies do we need to consider with an in-order superscalar processor? Which do we need to consider with an out-of-order superscala?. Discuss.  
(4p)

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7. If you compare the Pentium 4 with the Nehalem architecture, what is the basic difference? What is the reason for the evolution in this direction? Comment.  
(4p)
  
8. Why is superscalar not the ultimate solution? How do VLIW processors address some of the problems with superscalar processors? What are the advantages of VLIW architectures compared to superscalar? What are the disadvantages?  
(4p)
  
9. The Itanium architecture inherits some features of VLIW processors. Which are those features? There is one basic disadvantage of VLIW architectures which Itanium solves. What is that disadvantage and how is it solved with the Itanium architecture?  
(4p)
  
10. We have a parallel computer with 100 processors. If we run a program on it, do we get it 100 times faster? Justify your answer, explain, discuss.  
(4p)