

Computational Science and Engineering
Final Exam in
Computer Architecture and Networks

Winter Term 2012/2013
February 13, 2013

Total score: 80 points

Time: 60 minutes

Instructions:

Write all answers onto these sheets – no other answers will be considered! You will get additional scratch paper to work out your solutions, however, this will not be collected and not be considered!

This exam is a **closed book** exam - i.e. no books, notes, or similar aids and also no electronic calculators of any kind are permitted!

Please do not use red or green pens.

In case you need to leave the room, you need to deposit your test sheet. Only one person is allowed to leave the room at one time.

There will be an announcement 10 minutes before the end of the test time.

After the test, please remain seated until all tests have been collected and counted.

Name: _____

Matr. Number: _____

Signature: _____

Question 1, Numbering Systems (10 points):

In the following table, each row represents the same (positive) number represented in a different numbering system. The numbering system is denoted in the upper row. Complete the table by filling in the missing number representations!

Binary	Base 7	Decimal	Hexadecimal
11101101			
	666		
		17	
			BABA

Question 2, Pipelining (15 points):

Explain the difference between a standard pipeline, a superscalar pipeline and a VLIW pipeline by drawing an illustration for each case:

a) Standard Pipeline:

b) Superscalar Pipeline

c) VLIW Pipeline

Question 3, Processor/Architecture Development (15 points):

Moore's law states that the number of transistors on a chip doubles every 1 ½ years. While this led to an increase of clock frequencies without much need to rewrite your programs in order to obtain better performance. This was only feasible up to the Pentium 4's Netburst architecture. What have vendors used the increasing number of transistors for since then?

What does Bell's Law stand for?

Name two typical examples of the BlueGene like supercomputer class (not BlueGene itself!):

Question 4, Memory (10 points):

Draw a typical memory hierarchy of a computing system, depicting different access speed and capacity!

Given a cache line number of m , what are a 1-way set associative cache and an m -way set associative cache referred to as?

Question 5, Conditional Jumps (15 points):

How can conditional jumps in an if-then-else construct be avoided? Does this also work for nested if-then-else constructs? If yes, explain how!

Question 6, Networks (15 points):

Outline the ISO/OSI seven layer model being used as a generic model for computer networks:

What are the differences to the TCP/IP protocol suite, if any?