P-ITPRE-0006 COMPUTER ARCHITECTURES PREP COURSE ENTRANCE TEST

2021/22 – Semester 1

November 29, 2021

Name of the student:	
Student NEPTUN ID:	
Result:	

Answer **ALL** questions. Give very short answers and use figures/equations everywhere where it is possible.

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Digital processing architectures surrounds us in many form of devices. In order to design such a device one must understand its structural and architectural properties. The aim of the lecture is to get to know the basic building blocks of a digital architecture and the idea behind them.

Questions to be answered:

1. Today's computing architectures can be grouped in many different ways. One way is to select them by its instruction set. This way one can differentiate RISC and CISC computers.

   What do we call CISC computer? Summarize its main properties! Give a few examples for CISC processors!

2. What kind of properties does a Harvard architecture have?

3. An important part of the computer is the memory, which stands form memory cells. These cells can be static or dynamic.

   How does a DRAM (Dynamic Random Access Memory) cell looks like?

4. There are several kind of information stored in the memory, like integer, fix- or floating point numbers.

   Lets assume a theoretical system has binary fixed point representation, where the number is stored on 18bit with 2's complement and the binary point is placed to the fifth point from the left.

   What is the smallest positive number to be represented? What is the largest number? What is the largest negative number? What is the precision of the system?

5. Control units can be implemented in several ways. One of the most basic model of a control unit is the Mealy machine model.

Draw the basic block diagram of the model. What are its input, output and state variables? What is the relationship between these variables (output and next state of the system)?

6. Communication in a system between master and slave elements can be done in asynchronous and synchronous way, depending on an existence of a common clock signal.

How can blocks communicate with each other, when there is no common clock signal (asynchronous communication method)?

7. Virtual memory handling are required if there is not enough physical memory in the system.

What are the main differences between the segmentation and paging virtual memory systems?

8. Draw the block diagram of a PCI bus based computer!

9. Multiplication of two normalized floating point number requires more than just a multiplier unit.

Draw the basic block diagram of a floating point multiplier. (Hint: The diagram can be easily derived from the mathematical formula.)

10. Logic function minimization can be done in various ways. One possible solution for a relatively small problem is the Karnough-table.

Find a possible solution for the table below! (For additional points give a hazard free solution.)

		C		C	
		D	D		
		1	1	0	1
B		0	1	0	0
A B		0	1	0	0
A		1	1	0	1