

Remember to write detailed answers!

Indicate clearly the question you are answering. Do not copy the question in your answer. Write detailed answers – a couple of sentences is not a proper answer!

QUESTIONS

Q1

Explain what is branch prediction and what different strategies can be used in prediction. Explain in detail why branch prediction is very important in a modern processor.

Q2

Compare direct mapping and set associative mapping and explain in which ways set associative mapping is better than direct mapping.

Q3

Explain the following terms.

- a) SIMD
- b) Control hazard
- c) Cache coherency
- d) DMA

Q4

We have three processors:

- A. 7 stage pipeline, 1 GHz clock frequency
- B. 10 stage pipeline, 1.6 GHz clock frequency
- C. 16 stage pipeline, 1.8 GHz clock frequency

Three tests are run on each of the processors:

1. Program with 15360000 instructions where every 20th instruction is a branch that causes pipeline to be flushed.
2. Program with 15360000 instructions where every 30th instruction is a branch that causes pipeline to be flushed.
3. Program with 15360000 instructions where every 200th instruction is a branch that causes pipeline to be flushed.

Calculate the execution times of each test for each processor. For each test calculate SUF compared to the slowest processor in the test. SUFs for Test 1 are based only on Test1 results, etc.

Produce a matrix showing the results:

	Test 1	Test 2	Test 3
A			
B			
C			

Q5

Read <https://cturt.github.io/ps4.html> and explain which of the security measures in the article are implemented in the hardware and what parts of the CPU are in charge of enforcing the security measures. Explain how malicious code can be executed with ROP even when the security measures prevent injecting executable code in to the system.