CENG311 **Fall 2020**

PROGRAMMING ASSIGNMENT 4

Due date: 30.01.2021 23:00

In this assignment, you are required to run a set of experiments and analyze the results in order to understand the cache behavior of programs, how different cache designs affect program execution.

You will use the cache simulator (dcache) provided in Pin tool [1] to collect cache miss rates. You need to compile and run the matrix multiplication code provided as part of this assignment, then you will run the program by using the simulator as discussed in the lab session (or you can learn from the Pin user guide: https://software.intel.com/sites/landingpage/pintool/docs/98314/Pin/html/)

You will run the matrix multiplication program for a set of configurations with the following L1 cache parameters in the cache simulator:

L1 Size [KB]	Block size [B]	L1 Associativity
8	32	1
8	32	2
8	32	4
16	16	1
16	32	1
16	64	1
16	16	2
16	32	2
16	64	2
16	16	4
16	32	4
16	64	4
32	32	1
32	32	2
32	32	4

After executing the experiments with the default matrix size (N=1000), you will repeat the same set of experiments by setting the matrix size (N)=10. You will have 30 different executions (15 cache configurations, 2 input size).

After executing each experiment, collect the L1 data cache load miss rates (and/or any other relevant values), and draw graphs to demonstrate the effect of the cache parameters on miss rates. You need to show the L1 load miss rates in the graphs, you can use the other values to explain your results. Examine the results and explain them by providing your comments.

Notes:

- You can modify the simulator code such that it will get the cache parameters from the command line instead of compiling the code for each test case. It is not mandatory, but will decrease the time for the assignment completion substantially. It is also recommended to

prepare a test script including all the experiments (which is also not mandatory).

- You are required to submit a report that includes your results with graphs and comments about the results.
- You need to work individually, no group work is allowed.
- No late homework will be accepted.

Submission: You are required to submit your report to LMS in pdf format named as yourstudentnumber_P4.pdf (e.g. If your student number is 201812345678, the file name must be 201812345678_P4.pdf).

References:

[1] Pin - A Dynamic Binary Instrumentation Tool, https://software.intel.com/en-us/articles/pin-a-dynamic-binary-instrumentation-tool