THE UNIVERSITY OF ZAMBIA, SCHOOL OF NATURAL SCIENCES

DEPARTMENT OF COMPUTER SCIENCE

2019/2020 CSC 2111 TEST 2

INSTRUCTIONS: Answer ALL questions. DURATION: 2 HRS

QUESTION ONE

Consider a machine with a byte addressable main memory of 2^{16} bytes and block size of 8 bytes.

i. What is the *number* and *range* of addressable locations in the main memory?

[4 marks]

ii. Assuming that a direct mapped cache consisting of 32 lines is used with this machine,

a. How is a main memory address divided into tag, line, and word values?

[6 marks]

b. Into what line would bytes with each of the following addresses be stored?

[6 marks]

i. 0001 0001 0001 1011

ii. 1100 0011 0011 0100

iii. 1101 0000 0001 1101

c. Suppose the byte with address 0001 1010 0001 1010 is stored in the cache. What are the addresses of the other bytes stored along with it?

[4 marks]

QUESTION TWO

Assuming that a four-way set-associative mapped cache consisting of 32 lines is used with the machine from question one,

a. How is a main memory address divided into tag, set, and word number?

[6 marks]

b. Into what set would bytes with each of the following addresses be stored?

[4 marks]

i. 0001 0001 0011 1011

ii. 1100 0011 0010 0100

iii. 1101 0000 0001 1101

iv. 1010 1010 1010 1010

QUESTION THREE

In relation to main memory error correction functions:

i. Develop a SEC code for a 10-bit data word. (set up a table). **[10 marks]**

ii. Generate the code for the data word 0101101011. **[5 marks]**

iii. Show that the code will correctly identify an error in data bit 5. **[5 marks]**

QUESTION FOUR

2^4 2^3 2^2 2^1 2^0

16 8 4 2 1

Discuss the disk layout below. **[10]**