BLAKE MOORE CUID: C15205577

CPSC 2310 FALL 2022

Homework 3
Due: October 18, 2022
Submit to Gradescope

Answer the following questions from Chapter 1 and Chapter 2 notes. All answers MUST be in RED. When your answers are in red this makes grading easier and faster. If you choose to write your answers use a colored pen/pencil and I must be able to read your writing. If your answers are not in red or I cannot read your answer, you will receive a 0 on the question. If you do not show your work when specified, you will receive a 0 on the question.
Each question is on a separate page in the document. Please do not consolidate the pages. This will help with the grading on Gradescope.

Question 1 (2 points)
We discussed that a sequence of bits can represent a range of different types of data. The thing that distinguishes different data is what?
Context of the data

Question 2 (12points)

List and explain what each phase of the compilation system does. Be sure to mention, what the phase does, what file it uses and what file it produces.

Pre-processor – modifies original c program as the preprocessing directives decide to. Produces .i files (text file)

Compiler – translates text file (.i) to assembly language program (.s)

Assembler – translates assembly code into machine language instructions, then packages instructions in relocatable object program form. Stores result in object file (.o)

Linker – when calling external functions, linker merges object files with the main program, produces actual executable file

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Question 3 (6 points)
Name and describe the basic parts of the CPU.
ALU – arithmetic/logic unit
PC – program counter
USB – universal serial bus

Question 4 (3 points)

What is the purpose of the System Buses.

To carry electrical conduits that carry bytes of info between components

Question 5 (12 points)

Describe the terms below.

Main Memory – temp storage device that holds a program and data it changes while the processor is executing the program

Physical Memory – main memory consist of a collection of dynamically random access memory chips

Logical Memory – memory is organized as a linear array of bytes, each with its own unique memory address starting at 0.

Question 6 (8 points)

Name and briefly describe four types of operations the CPU might carry out at the request of an instruction.

Load – copy a byte or word from main memory into a register, overwiting the previous contents in the register

Store – copy a byte or a word form a register to a location in main memory, overwriting the previous contents of that location

Operate – copy contents of two registers to the ALU, perform arithmetic operation on the two words, and store the results in a register, overwriting the previous data

Jump – extract a word from the instruction itself and copy that word into the PC, overwriting the previous value

Question 7 (12 points)

What is cache memory, and why do we use it.

Temporary memory, we use it because you can access it more quickly

What is the significance of a "Cache hit"? it is when the algorithm predicts correctly, it is more efficient

What is the significance of a "Cache miss"? it is when the algorithm does not predict correctly, less efficient

Question 8(4 points)

We briefly described two important jobs of the operating system. Describe the two.

Protect hardware from misuse by rogue applications

Provide applications with simple and uniform mechanisms for manipulating complicated and different low-level hardware devices

Question 9(2 points)

_____ provides each process with the illusion that it has use of the main memory.

Virtual memory

Question 10(10 points)
From top (highest address) to bottom, label and describe the layout of Linux virtual address space as listed in the notes.

Kernel virtual memory
User stack
Memory mapped region for shared libraries
Run time heap
Read/write data Read-only code and data

Question 11(2 points)
True / False

Virtual address space for all computer architectures is identical to that of Linux.
False, however, it is very similar

Question 12(3 points)

When was the C programming language developed?

1969 - 1973

Who developed the C programming language and who did he work for?

Dennis Ritchie // Bell Laboratories

Question 13(2 points)
How many bits are there in 1 byte?
8 bits

Question 14(10 points)
Convert the following. You must show your work.
A.
Decimal to binary
103_{10}

1100111

B.
Binary to Decimal
11011001_2
217

C.
Hexadecimal to Binary
0x7D4A9BEC
00000111110101001010011011111101100

D.
Binary to Hexadecimal
$1011\ 0101\ 0001\ 1011\ 1011\ 1101\ 1100\ 0110_2$

B51BBDC6

E.
Hexadecimal to Decimal
0xA1F

2591

Question 15(12 points)

Without converting the entire numbers to decimal complete the mathematical operation. You must show your work.

A.

0x73AC
+0x04AC
785E

B.

0x6A8B
– 0x014E
693D

C.

10111001_2
+ 10010111_2
+ 11110111_2
1001000111

D.

11101001_2
– 11000101

00100100