CMSI 2210

Assignment #2

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1. **What is a “computer system”?**
   A computer system is a set of layers, with each layer working on the actions of the one beneath it. The idea is that each layer builds upon the functionality that is in the layer below it, and provides functionality to the layer above it. What allows a computer system to actually be a part of the real world is its input and output hardware.

2. **What are some of the parts of a computer system?**
   Some of the parts of a computer system include the Central Processing Unit (CPU), which encompasses the Arithmetic Logic Unit, the Control Unit, etc.. Along with this, we have the Random Access Memory (RAM) and the Input/Output System.

3. **What is the difference between a compiled language and an interpreted language?**
   In a compiled language, the target machine directly translates the program. This means that they are converted directly into machine code that the processor can execute, unlike interpreted languages which are not directly translated by the target machine. In an interpreted language, a different program (the interpreter) runs through a program line by line and executes each command.
   Source:
   https://www.freecodecamp.org/news/compiled-versus-interpreted-languages/#:~:text=In%20a%20compiled%20language%2C%20the,reads%20and%20executes%20the%20code.

4. **Is C a compiled language?**
   Yes, C is a compiled language. C programs are compiled directly to binary that the computer can execute.

5. **Who invented the C language?**
   The C language was invented by Dennis M. Ritchie.
   Source:
   https://en.wikipedia.org/wiki/C_(programming_language)

6. **How long has C been in use?**

   C has been in use for 50 years (since 1972).

   Source:

   https://en.wikipedia.org/wiki/C_(programming_language)#:~:text=In%201978%2C%20Brian%20Kernighan%20and,of%20The%20C%20Programming%20Language.

7. **Is a compiler a translator?**

   Yes, a compiler is a translator. Compilers convert high-level language code into machine code in one session.

   Source:

   https://www.microcontrollertips.com/compilers-translators-interpreters-assemblers-faq/

8. **Is an assembler a translator?**

   Yes, an assembler is a translator. An assembler translates assembly language into machine language.

   Source:

   https://www.microcontrollertips.com/compilers-translators-interpreters-assemblers-faq/

9. **What is the command to list out the contents of a directory on a mac terminal window?**

   The command used to list out the contents of a directory on a mac terminal window is:

   `ls`

10. **What does the C function atof() do?**

    The C function atof() converts a string argument to a floating-point number.

11. **What are the bottom two layers of a computer system? Give a brief description of each.**

    Level 0 (the bottom layer) of a computer system is known as Digital Logic. This is the hardware that all of the operations of the computer run on. This digital logic is implemented by gates, circuitry, motherboards, etc.. Level 1 is called the control layer. This layer uses the hardware from level 0 to contain the microcode.

12. What are the three steps of the Von Neumann Architecture?

The three steps of the Von Neumann Architecture are: (1) fetch (2) decode (3) execute. More specifically, the control unit fetches the next program instruction from memory. This instruction is decoded. Finally, the ALU executes the decoded instruction.

13. What is the purpose of an ALU?

The purpose of an ALU is to perform operations done on integers. This includes mathematical and bit-wise operations. In the Von Neumann Architecture, it is the ALU's responsibility to execute decoded instructions during the fetch-decode-execute cycle.

14. What is a register?

A register is a place to hold small amounts of information. Registers may hold an instruction, a storage address, or any kind of data.

15. What is one difference between Application software and System software?

Systems software is for operating computer hardware and for controlling and managing computer systems while applications software is installed and is written for people to solve problems of interest to humans.

16. Is the phrase cmp rdi, rsi machine language?

No, this is assembly language. Machine language is written in hexadecimal or binary code.

17. How many buses are included in the system bus?

There are 3 buses included in the system bus: data, address and control.

18. What is the decimal value of 10010111_2?

2^7 + 2^4 + 2^2 + 2^1 + 2^0

= 151

19. What is the decimal value of 11111111_2?

2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0

= 255

20. What is the largest unsigned integer value that will fit into 16 bits?

$1111111111111111_2 = 65,535$