**CSE 3302: Programming Languages**

**Spring 2018**

**Homework 03**

**Due on September 20, 2018 [ before 11:59 pm]**

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**Date: 9/19/2018**

**INSTRUCTIONS**

1. **Do NOT plagiarize.**
2. **No group-work. All work should be your own.**
3. **Do not discuss your work with other students in the class.**
4. **Cite sources where necessary.**
5. **Turn in your word document using Blackboard. Do not email your documents.**
6. **Name your document as netid.docx where *netid* is your UTA NetID. If you do not know your NetID, check what it is using NetID Self Service. Your 1000 number is NOT your NetID.**
7. **Try to answer each question within a few lines.**

**Questions:**

**1.** Design a “Half Adder” circuit for two inputs A and B. Now, design a “Full Adder” circuit using previously designed half adders. **[15 points]**

**CARRY**

**OR**

**HALF ADDER**

**C**

**A**

**A**

**C**

**HALF ADDER**

**A**

**S**

**B**

**B**

**SUM**

**C**

**S**

**B**

**2.** What is an overflow? When does it occur? **[6 points]**

**Overflow is when a computer tries to create a number larger than the maximum value or smaller than the minimum value. It occurs when the result of an addition is too large to be represented by the number of bits in the system.**

**3.** What is Random Access Memory? Why is this called so? **[6 points]**

**A form of volatile computer data storage that stores data so long as there is power to the machine. It is called Random Access Memory because any storage location can be accessed directly.**

**4.** What is “And-Or Latch”? Why is this called “latch”? **[5 points]**

**A circuit that has two stable states and can be used to store state information. It is called a latch because it “latches” onto a particular value and stays that way.**

**5.** What is “register”? **[3 points]**

**A group of latches that hold an instruction.**

**6.** What is “multiplexer”? **[3 points]**

**A device that takes in several inputs and selects one of them to be forwarded to output.**

**7.** Explain fetch phase, decode phase, and execute phase in short. **[12 points]**

**Fetch Phase: Receive first instruction.**

**Decode Phase: Figure out what kind instruction that was received in the Fetch Phase.**

**Execute Phase: Run the decoded instruction.**

**8.** What is clock speed? What is overclocking and underclocking? **[6 points]**

**Speed at which a CPU can carry out each step of the fetch-decode-execute cycle. Modifying the clock to speed or slow down the temp of the CPU.**

**9.** Why is security important for Programming Language Design? **[8 points]**

**Languages that have common security issues in mind when they are designed discourage programming errors and allows new errors to be discovered and reported.**

**10.** What would be some of the design goals if you were to design a Programming Language? Explain your answer. **[15 points]**

**If I were to design a programming language, I would try to make it as close to human language as possible. I would like to get rid of a lot of insider terms and types that we have created in the programming bubble. My goal would be to reduce the amount of typing so if you wanted to sort or search you would just type “sort” or “search” and choose the one you wanted from a drop-down list.**

**11.** What is “writability” of a programming language? **[3 points]**

**How easy it is to create programs with a particular programming language.**

**12.** What are the differences between primitive type and reference type in Java? **[5 points]**

**The JVM splits data types in to two separate categories. Ints, Booleans, char, short, float, and double are primitive types. Every other data type would be considered a reference type.**

**13.** What is “extra semicolon problem” in C++? **[3 points]**

**Putting a semicolon after a for or while statement which makes the only content within the loop’s scope the semicolon.**

**14.** What is “macro”? Write a piece of code using a macro. **[7 points]**

**Tool used to make tasks less repetitive and make code reusable.**

**#define YEAR 2018**

**cout << “The current year is: “ << YEAR << endl;**

**15.** What is “dynamic typing” mechanism? **[3 points]**

**Where variable names are only bound to an object.**

**Extra credit (bonus question):**

**1.** Give an example (do not use the examples from the slides and the book) of: **[15 points]**

a. Generality: **Data types**

b. Orthogonality: **Adding two elements of two objects using operator overload “+”**

c. Uniformity: **Putting the ++ operator before or after a variable.**