Introduction to Computer Science
Sample Waiver Questions

Multiple Choice .

The ASCII code and a sample machine language will be attached.

1. The physical components of a computer system are called
   a. hardware b. microcomputers c. an application program d. software

2. Another name for programs
   a. data b. software c. RAM d. storage

3. An operating system is
   a. hardware b. software c. an application program d. a microcomputer

4. In the e-mail address wshakespeare@mozart.aw.com, *mozart* is the
   a. user b. host c. domain d. none of these

5. Part of the central processing unit
   a. ALU b. JCL c. MSB d. None of these

6. A semaphore is
   a. a dichotomy of networks based on whether they come from one or many vendors
   b. a group of computer viruses and network worms
   c. a properly implemented flag
   d. a critical region

7. Area where the operating system resides
   a. ROM b. bootstrap program c. disk storage d. ALU e. CPU

8. The storage technology that uses laser beams
   a. magnetic disk b. magnetic tape c. optical disk d. floppy disk

9. Excess notation using 3 bits is called
   a. Excess 3 b. Excess 4 c. Excess 8 d. Excess 16 e. Excess 32

10. The speed of the CPU is generally ___ (than) the speed of an I/O device.
    a. slower b. faster c. about equal to

11. The contents of a storage address is the same as the address itself.
    a. true b. false

12. Parity bits are used to
    a. correct errors b. detect errors c. compress data d. none of these

13. A coding system to store special instructions associated with a batch job
    a. LIFO b. FIFO c. ROM d. JCL e. Java

14. The language(s) that can be understood by the central processing unit of a computer
    a. Machine code c. Java e. All of the above
    b. FORTRAN d. Assembler-level language

15. The largest whole number that can be represented using four bits is
    a. 16 b. 15 c. 7 d. none of these

16. The largest integer that could be represented in 21 bits using ASCII is
a. 999 b. 221 c. 220 d. $2^{21} - 1$ e. none of these

17. Can 9/16 be represented in the floating-point format of the sample machine?
a. No, exponent too large b. Yes c. No, too many significant digits

18. The range of values in two's complement using 5 bits is
a. 3 to - 4 b. 7 to -8 c. 15 to -16 d. 31 to -32 e. none of these

19. An op-code consisting of 5 bits can have a maximum of this many machine instructions
a. 4 b. 16 c. 32 d. 256 e. none of these

20. The number of cells in a computer's main memory if each cell's address can be represented by 1 hexadecimal digit is
a. 8 c. 27 e. 4096
b.16 d. 256 f. none of these

PART III Short Answer/Problems

1. a. Given the adjacent bit pattern, change it to hexadecimal.

0100 1111 0011 1100

b. Here is a word coded in ASCII given in hexadecimal form. What does it say?

53 70 72 69 6E 67

2. a. Convert the binary representation to its equivalent decimal form: 110.101

b. Perform the following addition in binary notation:

$$\begin{array}{r} 1010.011 \\ +\quad 1.101 \\ \hline \end{array}$$

3. Convert $9\ 3/8$ in base ten(decimal) representation to its equivalent binary form:

4. Convert -17 (decimal representation) to its equivalent two's complement notation using 8 bits.

5. Find the value of the given byte if the storage method was

a. ASCII b. Two's complement c. Floating-point format

0 1 0 0 1 1 0 1

6. Using the values in the box perform
a. AND
b. OR
c. XOR.

11001	00110

7. What is the result of performing a 3-bit left circular shift on the bit string 00001111

8. List and describe the steps within a computer's instruction cycle.

Using the sample machine instructions on the following page:

9. Suppose the memory cells at addresses FO through FD in the example machine described on the attached sheet contained the following (hex) values:

ADDRESS	CONTENTS	ADDRESS	CONTENTS
F0	20	F7	FC
F1	00	F8	50
F2	21	F9	01
F3	01	FA	B0
F4	23	FB	F6
F5	05	FC	C0
F6	B3	FD	00

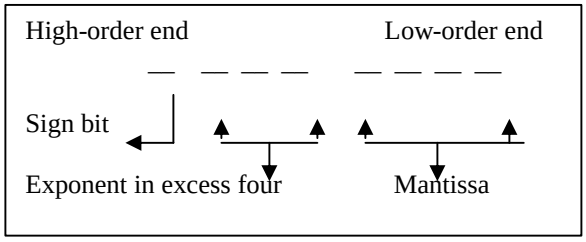
If we started the machine with the PC equal to F0, what would be the value in register R0 when the machine halts?

10. Write a machine language program to: add three numbers stored in List and describe the steps within a computer's instruction cycle.

Sample Machine

Machine Architecture

- 16 general-purpose registers numbered 0 through F(hexidecimal)
- Each register is one byte long
- Main Memory consists of 256 cells
- Address of each cell in main memory is 00 to FF(255)
- Each cell is 1 byte
- Floating-point values stored in one byte in the format at the right. Leftmost bit is sign bit; Next 3 represent the exponent in excess 4; Remaining 4 bits represent the mantissa. Radix point assumed to left of the mantissa.



Machine Language

Each instruction is 2 bytes long. Op-code is the first 4 bits; the last 12 bits make up the operand field. R, S and T are in place of hexadecimal digits in those fields. The letters X and Y are used in lieu of hexadecimal digits in variable fields not representing a register.

OP-CODE	***OPERAND***	***DESCRIPTION***
1	RXY	LOAD register **R** with the contents of the memory cell whose address is **XY.**
2	RXY	LOAD the register **R** with the value **XY**.
3	RXY	STORE the contents of register **R** in the memory cell whose address is **XY**.
4	0RS	MOVE the contents of register **R** to register **S.**
5	RST	ADD the contents of register **S** and **T** as though they were binary numbers(in two's complement) and leave the result in register **R**.
6	RST	ADD the contents of register **S** and **T** as though they represented values in floating-point notation and leave the floating-point result in register **R.**
7	RST	OR the contents of registers **S** and **T** and place the result in register **R.**
8	RST	AND the contents of registers **S** and **T** and place the result in register **R**.
9	RST	EXCLUSIVE OR the contents of registers **S** and **T** and place the result in register **R**.
A	R0X	ROTATE the contents of register **R** one bit to the right ***X*** times. Each time place the bit that started at the low order end at the high order end.
B	RXY	JUMP to the instruction located in the memory cell at address **XY** if the contents of register **R** is equal to the contents of register number **0**.
C	000	HALT execution.