20 M/C Questions **Name:** ________________________

Important Instructions

1. Read all the instructions and both sides (back and front) of all pages.
2. Answer the questions you know, first. One Answer Only per question.
3. Manage your time when answering questions on this test!

Multiple Choice - 20 Questions - 15 of 15%

(Office use only: 19 17 4 13 3 18 11 10 8 7 2 15 5 14 20 1 12 16 6 9)

1. Express in hex the value stored in memory by:
   `char x = 0xA5 | 0x5B`
   a. **`A55B hexadecimal`** *b.* **`166 hexadecimal`**
   c. **`00 hexadecimal`** *d.* **`FF hexadecimal`**
   e. **`A5 hexadecimal`**

2. What are the smallest and largest decimal integers a 16-bit word can hold using two's complement representation?
   a. **`–32,767 32,768`** *b.* **`–65,536 65,535`**
   c. **`–65,535 65,535`** *d.* **`–32,768 32,767`**
   e. **`–32,767 32,767`**

3. Given the MARIE instruction **`JUMP 123`** located at memory location **`203h`**, what is the value of the **`PC`** (a) *during* the actual decoding and execution of the instruction (from its location in the IR) and (b) *after* the instruction has finished executing?
   a. **`a) PC = 204h b) PC = 123h`**
   b. **`a) PC = 123h b) PC = 204h`**
   c. **`a) PC = 123h b) PC = 203h`**
   d. **`a) PC = 203h b) PC = 123h`**
   e. **`a) PC = 204h b) PC = 124h`**

4. If you add one (1) to each 10-bit decimal number below, which addition will cause the *overflow* flag to be set?
   a. **`1023`** *b.* **`1022`** *c.* **`511`**
   d. **`512`** *e.* **`513`**

5. The BIOS ROM table for characters starts at **`0xFFA6E`**, and each character uses 8 bytes. Upper-case **`J`** is ASCII code **`0x4A`**. Which is the ROM table address of this character?
   a. **`FFA6:004A`** *b.* **`FFA0:00B8`** *c.* **`FFE6:000E`**
   d. **`FFCB:000E`** *e.* **`FFAB:0008`**

6. Express in hexadecimal the value stored in memory by:
   `char x = ~0xA`
   a. **`F5 hexadecimal`** *b.* **`5 hexadecimal`**
   c. **`F6 hexadecimal`** *d.* **`FFF6 hexadecimal`**
   e. **`05 hexadecimal`**

7. Convert 80 decimal to octal (base 8):
   a. **`50 octal`** *b.* **`100 octal`** *c.* **`10 octal`**
   d. **`120 octal`** *e.* **`110 octal`**

8. ASCII upper-case **`L`** is **`0x4C`**. Represent this in eight bits using even parity and give the result in hexadecimal:
   a. **`0x04C`** *b.* **`0x4D`** *c.* **`0x4C`**
   d. **`0x14C`** *e.* **`0xCC`**

9. Which is equivalent to: **`(a + b′)′`**
   a. **`a + b′′`** *b.* **`a′ + b`** *c.* **`a′ + b′`**
   d. **`ab′`** *e.* **`a′b`**

10. ASCII upper-case **I** is **0x49**. Which of these is the ASCII code for lower-case **j**?
    a. **0x70** *b.* **0x50** *c.* **0x7C**
    d. **0x6A** *e.* **0x82**

11. Which DEBUG segment/offset address is equivalent to **E900:1234**?
    a. **DF10:C134** *b.* **E481:5B24** *c.* **DBEC:E384**
    d. **E400:6234** *e.* **DD60:DC34**

12. In 12-bit two's complement representation, what decimal number do you get when you add one to decimal **2,047**:
    a. **–2,047 decimal** *b.* **2,048 decimal**
    c. **–1 decimal** *d.* **–2,048 decimal**
    e. **0 decimal**

13. The mnemonic for a MARIE opcode of **'3'** is **ADD**. If the two-line MARIE program fragment **"ADD X"** followed by **"X, HEX 724"** is assembled and loaded into MARIE memory starting at location **202h**, what is the hexadecimal value of the memory at location **202h**:
    a. **3203 hexadecimal** *b.* **4725 hexadecimal**
    c. **3725 hexadecimal** *d.* **3724 hexadecimal**
    e. **3202 hexadecimal**

14. If you add one (1) to each 10-bit decimal number below, which addition will cause the *carry* flag to be set?
    a. **513** *b.* **1022** *c.* **1023**
    d. **511** *e.* **512**

15. If the 32-bit hexadecimal number **0x44332211** is stored in memory on a big-endian computer, what value is stored in the lowest address memory byte location?
    a. **22** *b.* **4** *c.* **44** *d.* **11** *e.* **1**

16. Which DEBUG segment/offset address is equivalent to **A120:0340**?
    a. **A150:0400** *b.* **A100:2340** *c.* **A123:0040**
    d. **D000:0520** *e.* **A000:1540**

17. Convert 95 decimal to hexadecimal (base 16):
    a. **515 hex** *b.* **514 hex** *c.* **5E hex**
    d. **5F hex** *e.* **145 hex**

18. How many different bit patterns (numbers) can be represented with 13 bits?
    a. **4,096 patterns** *b.* **8,192 patterns**
    c. **26 patterns** *d.* **2,048 patterns**
    e. **16,382 patterns**

19. A small computer has a 20 bit word length. Like MARIE, all instructions are one word long and have an opcode part and a single-address part. The instruction set opcode has space for 70 different operations. Given the number of bits remaining after the opcode, what is the range of addresses possible in this small machine?
    a. **0 to 4096** *b.* **0 to 8191** *c.* **0 to 4095**
    d. **0 to 2047** *e.* **0 to 8192**

20. Which is equivalent to: **(ab')'**
    a. **a' + b** *b.* **ab** *c.* **a'b'**
    d. **a'b** *e.* **a + b'**