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

1. 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 2047** *b.* **0 to 4095** *c.* **0 to 4096**
   d. **0 to 8192** *e.* **0 to 8191**

2. Express in hexadecimal the value stored in memory by:

```
char x = ~0xA
```

   a. **FFF6 hexadecimal** *b.* **F5 hexadecimal**
   c. **5 hexadecimal** *d.* **05 hexadecimal**
   e. **F6 hexadecimal**

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 = 123h b) PC = 204h**
   b. **a) PC = 123h b) PC = 203h**
   c. **a) PC = 203h b) PC = 123h**
   d. **a) PC = 204h b) PC = 124h**
   e. **a) PC = 204h b) PC = 123h**

4. If you add one (1) to each 10-bit decimal number below, which addition will cause the *carry* flag to be set?

   a. **1022** *b.* **513** *c.* **1023**
   d. **512** *e.* **511**

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. **FFCB:000E** *b.* **FFA6:004A** *c.* **FFAB:0008**
   d. **FFE6:000E** *e.* **FFA0:00B8**

6. Convert 80 decimal to octal (base 8):

   a. **120 octal** *b.* **100 octal** *c.* **10 octal**
   d. **110 octal** *e.* **50 octal**

7. Which DEBUG segment/offset address is equivalent to **E900:1234**?

   a. **E481:5B24** *b.* **DD60:DC34** *c.* **DBEC:E384**
   d. **E400:6234** *e.* **DF10:C134**

8. Express in hex the value stored in memory by:

```
char x = 0xA5 | 0x5B
```

   a. **A5 hexadecimal** *b.* **00 hexadecimal**
   c. **A55B hexadecimal** *d.* **166 hexadecimal**
   e. **FF hexadecimal**

9. 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.* **44** *c.* **4** *d.* **11** *e.* **1**

10. 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. **3725 hexadecimal** *b.* **3724 hexadecimal**
    c. **4725 hexadecimal** *d.* **3202 hexadecimal**
    e. **3203 hexadecimal**

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

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

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

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

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

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

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

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

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

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