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

Important Instructions

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

Multiple Choice - 20 Questions - 15 of 15%

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

1. If you add one (1) to each 9-bit decimal number below, which addition will cause the *overflow* flag to be set?
   a. **256**
   b. **510**
   c. **257**
   d. **255**
   e. **511**

2. The BIOS ROM table for characters starts at **0xFFA6E**, and each character uses 8 bytes. Upper-case **Z** is ASCII code **0x5A**. Which is the ROM table address of this character?
   a. **FFA6:005A**
   b. **FFA6:0068**
   c. **FFD3:000E**
   d. **FFA6:02D0**
   e. **FFAC:0008**

3. Express in hexadecimal the value stored in memory by:
   ```
   char x = ~0x4
   ```
   a. **FFFB hexadecimal**
   b. **FB hexadecimal**
   c. **B hexadecimal**
   d. **0B hexadecimal**
   e. **F4 hexadecimal**

4. ASCII upper-case **Z** is **0x5A**. Represent this in eight bits using odd parity and give the result in hexadecimal:
   a. **0x05A**
   b. **0x5A**
   c. **0x15A**
   d. **0xDA**
   e. **0x5B**

5. ASCII upper-case **Z** is **0x5A**. Which of these is the ASCII code for lower-case **a**?
   a. **0x55**
   b. **0x41**
   c. **0x34**
   d. **0x35**
   e. **0x61**

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

7. Which DEBUG segment/offset address is equivalent to **A000:1234**?
   a. **A100:0234**
   b. **A123:4000**
   c. **A120:0340**
   d. **A001:2340**
   e. **A120:3400**

8. How many different bit patterns (numbers) can be represented with 11 bits?
   a. **4096 patterns**
   b. **22 patterns**
   c. **2048 patterns**
   d. **2047 patterns**
   e. **1024 patterns**

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

10. Express in hex the value stored in memory by:
    `char x = 0xAA | 0x77`
    a. **AA hexadecimal**
    b. **77 hexadecimal**
    c. **AA77 hexadecimal**
    d. **FF hexadecimal**
    e. **121 hexadecimal**

11. A small computer has an 18 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 48 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 2047**
    c. **0 to 1023**
    d. **0 to 2048**
    e. **0 to 4095**

12. If the number **0x12345678** is stored in memory on a little-endian computer, what value is stored in the lowest memory byte location?
    a. **12**
    b. **78**
    c. **8**
    d. **1**
    e. **123**

13. Convert 91 decimal to hexadecimal (base 16):
    a. **91 hex**
    b. **133 hex**
    c. **511 hex**
    d. **145 hex**
    e. **5B hex**

14. The mnemonic for a MARIE opcode of **'4'** is **SUBT**. If the two-line MARIE program fragment **"SUBT FOO"** followed by **"FOO, HEX 2021"** is assembled and loaded into MARIE memory starting at location **724h**, what is the hexadecimal value of the memory at location **724h**:
    a. **2020 hexadecimal**
    b. **7254 hexadecimal**
    c. **4724 hexadecimal**
    d. **2021 hexadecimal**
    e. **4725 hexadecimal**

15. Which DEBUG segment/offset address is equivalent to **E900:1234**?
    a. **E587:49C4**
    b. **DD60:DC34**
    c. **DBEC:E384**
    d. **DF10:C134**
    e. **E481:5B24**

16. Convert 46 decimal to octal (base 8):
    a. **38 octal**
    b. **46 octal**
    c. **56 octal**
    d. **2E octal**
    e. **106 octal**

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

18. If you add one (1) to each 9-bit decimal number below, which addition will cause the *carry* flag to be set?
    a. **257**
    b. **256**
    c. **510**
    d. **511**
    e. **255**

19. In 16-bit two's complement representation, what decimal number do you get when you add one to decimal **32,767**:
    a. **0 decimal**
    b. **−32,767 decimal**
    c. **32,768 decimal**
    d. **−32,768 decimal**
    e. **−1 decimal**

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