Name: ____ **Lab Section:** _________________

Objectives: To review important concepts in Chapters 3 and 4. ***Answer on this sheet where space is given.***

References: ECOA2e Section 2.6.3, 2.6.4, 3.2.1-3.2.4, 4.1-4.6, 4.8.1-4.9.1, 4.9.3, 4.10, 4.11.1-4.11.2 and associated Chapter Slides. Class Notes (via course home page): **bit_operations.txt**, **text_errata.txt,** etc.

If ***underlined space*** is given, put your answer ***on this question sheet,*** otherwise answer on paper. ***Circle*** answers on this sheet if indicated. On your answer paper, your answers must be ***in ascending order*** and each answer must be numbered. Not all questions may be marked – *check all your answers against the answer sheet when it is posted.*

1. Give the range of unprintable ASCII "Control" characters in decimal and hexadecimal. (Section 2.6.3)
   ____
2. How many bits are needed to represent the unprintable ASCII "Control" characters? ___________________
3. What is the name and hexadecimal and decimal value of the first printable character (first non-Control character) in the ASCII character set? ____
4. The ASCII code for **Z** is decimal 90 (0x5A). Derive the code for **CTRL-Z** in decimal and hexadecimal:
   ____
5. If the ASCII code for **Z** is decimal 90 (0x5A), what is the code for **Y** in decimal and hex? ______________
6. What ASCII character do you get if you subtract the ASCII code for **Space** from the code for lower-case **m**? (see Table 2.7 p.79) ____
7. Does the above subtraction transform work for all the lower-case ASCII letters? ______________________
8. Represent the seven-bit ASCII character **Z** in eight bits using odd parity. (Section 2.6.3) _______________
9. Represent the seven-bit ASCII control character **CTRL-Z** in eight bits using odd parity. _______________
10. You look into memory and you see the value 0x5A5A. How can you tell if this is two ASCII letters or a numeric data value? ____
11. How many bytes does it take to store a base Unicode character? (Section 2.6.4) _______________________
12. Circle: True / False – the first 128 characters of Unicode (0x0000 to 0x007F) are the same as ASCII. (p.80)
13. Construct a Boolean truth table for **xyz + (xyz)'** [where the prime mark indicates complement]. (p.155)
14. Construct a Boolean truth table for **x(yz'+x'y)** [where the prime mark indicates complement]. (p.155)
15. Give both versions of deMorgan's Law (p.113): ____
16. Using deMorgan's Law, write an expression for the Boolean complement of **x(y'+z)**. (p.155 and Section 3.2.2-3.2.4) ____

17. Using deMorgan's Law, write an expression for the Boolean complement of **xy+x'z+yz'**. (Section 3.2.2-3.2.4)
    ____
18. Avoiding a Common Error: Use a truth table to show that **(xy)'** is not equal to **x'y'** and **(x+y)'** is not equal to **x'+y'**. (i.e. "not red Jello" is much more specific than "not red and not Jello".) (bottom p.113)
19. Express in hexadecimal the value stored in memory by each of the following C bitwise expressions:
20. char x = ~0x1; ______________ char x = ~0x10; _______________ char x = ~0 & 0xAA; ____________
    int x = ~0x1; _________________________________ int x = ~0x10; ______________________________
    int x = ~0 & 0xAA; ____________________________ char x = 0x11 | 0xAA; ______________________
21. Give (hex) a bit mask that will mask off (zero) everything except a MARIE opcode: ___________________
22. Give (hex) a bit mask that will mask off (zero) everything except a MARIE address: ___________________
23. Give a C language expression that will turn an ASCII Control character "**ch**" into the corresponding ASCII lower-case letter:____
24. How many address bits do you need to address byte-addressable 2Mx32 memory? ____________________
25. How many address bits do you need to address word-addressable 2Mx32 memory? ___________________
26. How many address bits do you need to address byte-addressable 4Mx16 memory? ____________________
27. How many address bits do you need to address word-addressable 4Mx16 memory? ___________________
28. Question 8, p.238: a) ____________ b) _____________ c) _______________ d) ___________________
29. Question 9, p.238: a) ____________________ b) ______________________ c) ____________________
30. Memorize the names and functions of the seven MARIE registers on p.191. Write the full names of the registers here: ____
    ____
31. Circle: True / False – unlike MARIE, modern computers have multiple general-purpose registers. (p.192)
32. Circle: True / False – unlike MARIE, the ISAs of modern computers have hundreds of instructions. (p.193)
33. Memorize the meanings of the nine basic MARIE instructions in Table 4.2. Reproduce that table here:
    ____
    ____
    ____
    ____
    ____
    ____
    ____
    ____
    ____