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ICS 232 Computer Organization & Architecture
Mid-Term Exam Review

1. Memory organization / hierarchy.
    a. Registers
    b. L1, L2 cache
    c. RAM
    d. Disk

2. Measurement systems: storage sizes and timing
    a. KB, MB, GB, TB
    b. ns, µs, ms, sec

3. Numeric conversions:
    a. binary conversions - ones complement, twos complement
    b. Hex addition / subtraction
    c. Big vs Little Endian
    d. IEEE floating point

4. Ranges of numbers in signed and unsigned

5. ASCII / Unicode conversion

6. Design a circuit from a boolean expression

7. From a circuit what is the boolean expression

8. Give a truth table for a boolean expression

9. MARIE programming

```
if (A > 5)
     B = 6;

A = A + 3 - (C + 4)
```

10. Simple C program

11. RISC vs CISC differences

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a. Fixed vs Variable Length Instructions
b. RISC has large number of registers
c. RISC is usually load/store architecture
d. RISC has smaller number of instructions

12. Types of interrupts and how they are handled

13. RPN:

```
A + B / C - 4 (infix)
A B C / + 4 - (postfix)
```

Examples:

-99 (10) to hex 2-complement.

```
99 / 2 = 49 r 1
49 / 2 = 24 r 1
24 / 2 = 12 r 0
12 / 2 = 6 r 0
6  / 2 = 3 r 0
3  / 2 = 1 r 1
1  / 2 = 0 r 1

0 1 1 0 0 0 1 1 = 63 (16)
1 0 0 1 1 1 0 0 = one complement
              +1
1 0 0 1 1 1 0 1 = 9D (16)
```

0.125(10) to binary and hex

```
0.125 * 2 = 0.250
0.250 * 2 = 0.500
0.500 * 2 = 1.000
0.000
.0010 (2) = 0.2 (16)
```

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Hex arithmetic

```
 1
 9A4C
+16B2
=====
 B0FE
 3210
```

```
11 * 16^3 + 0 * 16^2 + 15 * 16^1 + 14 * 16^0 = 45310
```

```
Big Endian
00 00 B0 FE
```

```
Little Endian
FE B0 00 00
```

Character representation

```
"789 a π"
ASCII = 37 38 39 20 61 20 ??
Unicode =          0037 0038 0039 0020 0061 0020 03C0
Unicode (little) = 3700 3800 3900 2000 6100 2000 C003
```

IEEE Single Precision floating point

12.75

```
1100.11 (2)
1.10011 * 2^3
0 10000010 10011000000000000000000 (2)
414c0000 (16)
```

-99.50

```
01100011.1000
1.1000111000 * 2^6
1 10000101 1000111000...00
```