CMPE 12 Homework #1

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Lab Section #2

October 20th, 2014

1. Refer to the table supplied in the textbook for the next few questions.

   (a) What binary value does location 3 contain? What about location 6?
   Answer : Location 3 contains the binary value 0000 0000 0000 0000, location 6 contains 000 0110 1101 1001.

   (b) Binary values can be interpreted in different ways, interpret the values in the given table as instructed so by the probnlems below.

      i. Interpret location 0 and location 1 in two's compliment.
      Answer : Location 0 contains 7,747, location 1 contains -4,059.

      ii. Interpret location 4 as an ASCII value.
      Answer : 'e'.

      iii. Interpret locations 6 and 7 and an IEEE floating point number. (7 being the high bits, 6 being the low).
      Answer : $0\,00001101\,10110011111111011010011 = 8.200075825809130434623158725 41E\text{-}35$

      iv. Interpret locations 1 and 0 and unsigned integers. **Answer :** Location 0 contains 7,474, and location 1 contains 61,477.

   (c) Interpret the data in location 0 as an instruction.
   Answer : The opcode 0001 corresponds to the ADD operation. This operation has a 0 in the 5th bit place, which means it is operating on two source registers. The operation is $R7 = R1 + R3$.

   (d) Interpret the data in location 5 as an address, then state the data that is at that address.
   Answer : Location 5 contains the address 6. Location 6 contains the value `0xfed3`.

2. Suppose a 32-bit opcode takes the format of

OPCODE	SR	DR	IMM

   If there are 60 opcodes and 32 registers, what is the range of values that can be represented by the intermediate (IMM)?
   Answer : To represent 60 opcodes, you would need 6 bits (this would give you 4 extra). To address 32 registers, you would need exactly 5 bits. Thus to state an opcode and 2 registers, you would need to use 16 bits. This would leave 16 bits for the IMM. $2^{16} = 65,536$. Thus any addressed within 65,536 of the current position can be accessed.

3. Using the same 32-bit instruction format as above, except there needs to be 225 opcodes and a 120 registers to address.

   (a) Minimum number of bits to represent an opcode? **Answer :** 8 bits.

   (b) Min. number of bits to represent the Destination register? **Answer :** 7 bits.

   (c) What is the maximum number of unused bits in the instruction encoding? **Answer :** 3 unused bits.

4. Describe the execution of the JMP instruction if R3 contains `x369C`.
   Answer :

5.

6.

7.

8.

9.

10.

11.