**CSCI240 – Computer Organization and Assembly Language Programming**

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**Assignment:** Patt and Patel, Chapter 4: 5, 6, 7, 8, 10, 11, 12, 13, 15, 16

5.

a) Location 3 contains the value 0

Location 6 contains the value 301

1111 1110 1101 0011

0000 0001 0010 1100

0000 0001 0010 1101

301

b) (1)

Location 0: 0001 1110 0100 0011 = 7747

Location 1: 1111 0000 0010 0101 = -37

(2)

Location 4: 0000 0000 0110 0101 = ‘e’ or 101

(3)

Location 6: 1111 1110 1101 0011 =

Location 7: 0000 0110 1101 1001 =

(4)

Location 0: 0001 1110 0100 0011 = 7747

Location 1: 1111 0000 0010 0101 = 61477

c) Add the value in R7 to the value in R1 and the save result in R3

d)

6. The two components of an instruction are the opcode and the operands. The opcode contains what the instruction does. The operands are what the instruction will operate on.

7. 60 opcodes require 6 bits, and 32 registers require 5 bits each, therefore the remaining 16 bits can be used for representing the IMM. The range of a 16 bit 2’s complement integer is -32768 to 32767

8. a) Minimum number of bits to represent the opcode is 8 bits

b) Minimum number of bits to represent the destination register is 7 bits

c) There are 3 unused bits in the instruction (8 + 7 + 7 + 7 = 29, 32-29 = 3)

10.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Fetch Instruction | Decode | Evaluate Address | Fetch Data | Execute | Store Result |
| PC |  |  |  |  | JMP |  |
| IR |  |  |  |  |  |  |
| MAR |  |  |  |  |  |  |
| MDR |  |  |  |  |  |  |

11. Fetch: Retrieve instruction from memory and load next instruction to PC

Decode: Figure out what the instruction is supposed to do.

Evaluate Address: Calculate memory address location

Fetch Operands: Retrieve operands from memory

Execute: Perform instruction

Store Results: Send result to a certain destination

12.

13.

15.

16.