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| **CS 224, SP2015**  **Homework #2**  **S03: MSP430 ISA** | Name | | Section | Score  / 44 |
| Questions: | | Answers: | | |
| 1. (4 points) Suppose a 32-bit instruction has the following format:  OPCODE | SR | DR | IMM  (Opcode, Source Register, Destination Register, Immediate Value)  If there are 60 defined opcodes and 32 registers that can be used either for the source and/or destination register, what is the largest **positive** number that can be represented by the immediate (IMM) field? (Assume IMM is a 2's complement number.) | |  | | |
| 2. (3 points) What is the V bit in the status register (r2), when is it set, and what sets/clears it when performing a 2’s complement addition? | |  | | |
| 3. (13 points) Disassemble the following 25 memory words: (Hint: There are 13 instructions. Make up your own labels. Use hexadecimal notation for constants and absolute locations.)  **0x809c: 8392**  **0x809e: 0200**  **0x80a0: 2005**  **0x80a2: 40B2**  **0x80a4: 03E8**  **0x80a6: 0200**  **0x80a8: E3E2**  **0x80aa: 0021**  **0x80ac: 9382**  **0x80ae: 0202**  **0x80b0: 240D**  **0x80b2: D3D2**  **0x80b4: 0021**  **0x80b6: E0F2**  **0x80b8: 0010**  **0x80ba: 001D**  **0x80bc: 8392**  **0x80be: 0202**  **0x80c0: 2005**  **0x80c2: C3D2**  **0x80c4: 0021**  **0x80c6: C0B1**  **0x80c8: 0010**  **0x80ca: 0000**  **0x80cc: 1300** | |  | | |
| 4. (6 points) If the value in **R4** is 0x0008, what will the value be in **R5** after executing the following 5 lines of binary code? What does the binary program do with R4?  **0100 0100 0000 0101**  **0101 0101 0000 0101**  **0101 0101 0000 0101**  **0101 0100 0000 0101**  **0101 0101 0000 0101** | |  | | |
| 5. (6 points) How many possible locations (memory space) are there in a computer’s memory given the size of the address bus is *n* bits? If there are 8 bits at every memory location (addressability), what is the minimum size of the data bus? What is the total possible size (in bits) of a computer’s memory? | |  | | |
| 6. (3 points) Since the MSP430 ISA uses only 1 bit for selecting the destination address mode, how are four destination addressing modes defined? | |  | | |
| 7. (3 points) The MSP430 ISA defines the following instruction as either a 1 word or 2 word instruction. Explain.  **mov.w #1,r4** | |  | | |
| 8. (3 points) If the most significant 12 bits of a 16-bit, byte addressable, memory address is used to select a single memory mapped I/O space, how many memory mapped locations are possible? | |  | | |
| 9. (3 points) What is the memory address of the source operand for the following 2 word instruction (located in memory location 0x800a)?  **800a: 4014**  **800c: 8204** | |  | | |