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CS 318

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**Problem 1**

1. The opcode must use at least 5 bits because 5 bits allows for 32 (25) unique codes, which would cover all 30 different instructions.
2. The immediate values must be expressed using 11 bits at minimum. Because 211 = 2048, we can represent all of the 2048 values between -1024 and +1023 (including 0).
3. Because the instruction uses 24 bits, and we have used 5 for the opcode and 11 for the immediate, we are left with 8 bits for the registers. There are 2 registers using the same number of bits, so each register uses 4 bits
4. Registers are represented with 4 bits so the maximum number of registers would be 16, or 24

**Problem 2**

1. X2 = X0 + X1 = 4 + 6 = 10

X3 = X2 + X1 = 10 + 6 = 16

X4 = X2 + X2 = 10 + 10 = 20

X5 = X2 + X3 = 10 + 16 = 26  


1. X2 = 10  
   X3 = 26  
   X4 = 20  
   X5 = 36
2. ADD X2,X0,X1  
     
   NOP   
   ADD X3,X2,X1   
   ADD X4,X2,X  
   ADD X5,X2,X3

