**COEN 316 – Computer Architecture and Design**

**Department of Electrical and Computer Engineering**

**Assignment 2, Winter 2023**

| **Due: Tuesday, Feb. 28, 2023** |
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| In this assignment, you will answer the following questions. Write your answer in the exact place: |

| **Your Information:** |
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| First Name: |
| Last Name: |
| Student ID: |
| **Grade:** |

| **Question 1** | **Grade** |
|---|---|
| 1. The floating-point format to be used in this problem is an 8-bit IEEE 754 normalized format with 1 sign bit, 4 exponent bits, and 3 mantissa bits. It is identical to the 32-bit and 64-bit formats in terms of the meaning of fields and special encodings. The exponent field employs an excess-7 coding. The bit fields in a number are (sign, exponent, mantissa). Assume that we use unbiased rounding to the nearest even specified in the IEEE floating point standard.<br>Encode the following numbers in the 8-bit IEEE format:<br>(1) 0.0011011binary<br>(2) 15.0decimal | **20** |

| **Question 2** | **Grade** |
|---|---|
| Assume the following C code:<br>`int sum(int n) {`<br>`  if (n != 0)`<br>`  // sum() function calls itself`<br>`  return n + sum(n-1);`<br>`  else`<br>`  return n;`<br>`}`<br><br>a. Convert the C code into MIPS assembly assuming:<br>• **argument n is in $a0**<br>• **result is in $v0**<br><br>Note: sum is a non-leaf recursive procedure. Hence, registers have to be saved in the stack.<br><br>b. Assuming n=4, how many write accesses in the stack will be needed to execute the procedure? | **50** |

| Question 3 | Grade |
|---|---|
| 2- Show how each of the following MIPS instructions is converted into machine code. Assume the memory address of the first instruction is 100 hex.<br>addi $t0, $Zero, -50<br>andi $t1, $t0, 7<br>Loop:and $t1,$t0,$t1<br>Sw $t0, 40 ($t1)<br>Bne $t1,$ zero, Loop | **30** |

| Grading Policy: |
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| The assignment score is out of 100 points.<br>Here are some aspects that may lead to points deduction:<br>• The answers are missing.<br>• Missing steps.<br>• Inappropriate data to answer your question.<br>• Do your best to include exhaustive details, the final answer alone is not enough to get points.<br>• Collaborate on the individual assignment. |