# CMSI 2210 Fall 2023 HOMEWORK 03 SOLUTIONS

| **#** | **Problems “C-level”** | **Solution** |
| --- | --- | --- |
| 1 | Hex FAC3 in binary is: | 1111 1010 1100 0011 |
| 2 | Hex FAC3 as an unsigned decimal is: | 64195 |
| 3 | Hex FAC3 as a signed decimal is: | -1341 [1111101011000011 2's comp=> 0000010100111101] |
| 4 | Hex 0064 in binary is: | 0000 0000 0110 0100 |
| 5 | Hex 0064 as an unsigned decimal is: | 100 |
| 6 | Hex 0064 as a signed decimal is: | 100 |
| 7 | Hex 8000 in binary is: | 1000 0000 0000 0000 |
| 8 | Hex 8000 as an unsigned decimal is: | 32768 |
| 9 | Hex 8000 as a signed decimal is: | -32768 |
| 10 | Decimal 8000 encoded in 16-bits (unsigned) is in hex: | 0001 1111 0100 0000 => 0x1F40 |
| 11 | Decimal 8000 encoded in 16-bits (signed) is in hex: | 0001 1111 0100 0000 => 0x1F40 |
| 12 | Decimal -11 encoded in 16-bits (signed) is in hex: | 0xFFF5 |
| 13 | Decimal -32717 encoded in 16-bits (signed) is in hex: | 0x8033 |
| 14 | Binary 10111101 in hex is: | 0xBD |
| 15 | Binary 1011110100000001 as an unsigned decimal is: | 48385 |
| 16 | Binary 1011110100000001 as a signed decimal is: | - 17151 |
| 17 | If we had 20-bit registers, the smallest signed decimal value would be: | -524288 |
| 18 | If we had 20-bit registers, the largest signed decimal value would be: | 524287 |
| 19 | The modular sum of 16-bit hex values 3511 + 4FFC is: | 0x850D |
| 20 | The saturated sum of 16-bit hex values 3511 + 4FFC is: | 0x850D |
| 21 | The 16-bit operation 3511 + 4FFC has a carry (Y or N): | N [850D fits within 16 bits] |
| 22 | The 16-bit operation 3511 + 4FFC has an overflow (Y or N): | Y [850D is negative, but it’s addition of 2 pos.] |

| **#** | **Problems “B-level”** | **Solution** |
| --- | --- | --- |
|  | Work all “C-level” problems | PLUS the following: |
| 1 | The modular sum of 16-bit hex values 6159 + F702 is: | 0x585B |
| 2 | The saturated sum of 16-bit hex values 6159 + F702 is: 0x585B | 0xFFFF |
| 3 | The 16-bit operation 6159 + F702 has a carry  (Y or N): | Y [the result has a carry, making 0x 1 585B which won’t fit] |
| 4 | The 16-bit operation 6159 + F702 has an overflow (Y or N): | N [the values in dec. are 24921 – 2302 = 22619  and the outcome, 585B is pos.][also signs are different] |
| 5 | The modular sum of 16-bit hex values EEEE + C00C is: | 0xAEFA |
| 6 | The saturated sum of 16-bit hex values EEEE + C00C is: | 0xFFFF |
| 7 | The 16-bit operation 9EEE + AB0C has a carry (Y or N): | Y |
| 8 | The 16-bit operation 9EEE + AB0C has an overflow (Y or N): | Y [two negatives added with positive result in 16 bits] |
| 9 | The negation of 16-bit word B00F is: | 1011 0000 0000 1111 => 0100 1111 1111 0001 0x4FF1 |
| 10 | The negation of 16-bit word 0x2232 is: | 0010 0010 0011 0010 => 1101 1101 1100 1110 0xDDCE |
| 11 | The negation of 16-bit word 8000 is: | 1000 0000 0000 0000 => 1000 0000 0000 0000 0x8000 |
| 12 | The negation of 32-bit word FFF329BA is: | 1111 1111 1111 0011 0010 1001 1011 1010 =>  0000 0000 0000 1100 1101 0110 0100 0110 =>  000C D646 |
| 13 | 96.03125 as a 32-bit float, in hex is: | 0x42C0 1000 [0100 0010 1100 0000 0001 0000 0000 0000] |
| 14 | -16777216 as a 32-bit float, in hex is: | 0xCB80 0000 [1 11111110 000 0000 0000 0000 0000 0000] or  [1111 1111 0000 0000 0000 0000 0000 0000] |
| 15 | Hex 43700000, when interpreted as an IEEE-754 pattern, is in decimal: | 240 [0 10000110 111 0000 0000 0000 0000 0000] or  [0100 0011 0111 0000 0000 0000 0000 0000] |
| 16 | Hex C0FF0000, when interpreted as an IEEE-754 pattern, is in decimal: | –7.96875 [1.1111111 x 2(129 – 127) or 111.11111] [1 10000001 111 1111 0000 0000 0000 0000] or  [1100 0000 1111 1111 0000 0000 0000 0000] |

| **#** | **Problems “A-level”** | **Solution** |
| --- | --- | --- |
|  | Work all “C-level” AND “B-level” problems | PLUS the following: |
| 1 | The largest finite IEEE-754 single precision float, in hex is: | 0x7F7F FFFF representing 3.4028234e+38 [0 11111110 111 1111 1111 1111 1111 1111] or  [0111 1111 0111 1111 1111 1111 1111 1111] |
| 2 | The smallest finite IEEE-754 single precision float, in hex is: | 0xFF7FFFFF representing -3.40282346639e+38 [1 11111110 111 1111 1111 1111 1111 1111] or  [1111 1111 0111 1111 1111 1111 1111 1111] |
| 3 | The largest non-zero negative IEEE-754 single precision float, in hex is: | 0x80000001 [1000 0000 0000 0000 0000 0000 0000 0001]  Representing -1.40129846432e-45 or  -0.0000000000000000000000000000000000000000000001401… |
| 4 | The smallest non-zero positive IEEE-754 single precision float, in hex is: | 0x00000001 [0000 0000 0000 0000 0000 0000 0000 0001]  Representing -1.40129846432e-45 or  0.0000000000000000000000000000000000000000000001401… |
| 5 | -5.125 X 290 as a 32-bit float, in hex is: | 290 = 1,237,940,039,285,380,274,899,124,224  That times -5.125 is -6.344442701337573908858011648  0xEDA40000 [1 11011011 01001000000 0000 0000 0000] or  [1110 1101 1010 0100 0000 0000 0000 0000] |
| 6 | 2-138 as a 32-bit float, in hex is: | 0x00000800 [denormalized] [0 00000000 000 0000 0000 1000 0000 0000]  Exponent = 00000000 which is 2-126 denormalized  Mantissa = 0x0800 which is 0.000244140625 |
| 7 | 1.5 X 2-143 as a 32-bit float, in hex is: | 0x00000060 [denormalized]  [0 00000000 000 0000 0000 0000 0110 0000] or  [0000 0000 0000 0000 0000 0000 0110 0000] |
| 8 | OPTIONAL — Try this for a challenge, a puzzle, or the experience:  Hex C059 0000 0000 0000, when interpreted as a 64-bit IEEE-754 pattern, is in decimal: | -100 |