Answer all questions completely. Put a box around the final solution. Put your name on it. Show your work.

1. Convert the following binary number to floating point format. Give your answer as 4 hexadecimal bytes. (20 points)

$$-11011101.0001010001011111001$$

Sign is negative so sign bit = 1

Convert to scientific notation

-1.10111010001010001011111001 x 2^7

Convert exponent
E – 127 = 7
E = 134_{10} = 2^7 + 2^2 + 2^1 = 1000 0110

Structure the 32 bit number
1 1000 0110 1011 1010 0010 1000 1011 111

Regroup
1100 0011 0101 1101 0001 0100 0101 1111

Convert to hex
0xC3 5D 14 5F

2. Given the combinational logic circuit in Figure 1:
   a. Give the Boolean expression for 1, 2, 3, 4, and the Output. (20 points)

1 = AB
2 = C'
3 = 1 + 2 = AB + C'
4 = 3 ⊕ D = (AB + C') ⊕ D
Output = 4' = ((AB + C') ⊕ D)'

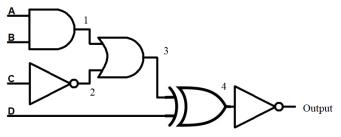   b. Complete the truth table for the circuit. (40 points)

Figure 1

A	B	C	D	1	2	3	4	Output
0	0	0	0	0	1	1	1	0
0	0	0	1	0	1	1	0	1
0	0	1	0	0	0	0	0	1
0	0	1	1	0	0	0	1	0
0	1	0	0	0	1	1	1	0
0	1	0	1	0	1	1	0	1
0	1	1	0	0	0	0	0	1
0	1	1	1	0	0	0	1	0
1	0	0	0	0	1	1	1	0
1	0	0	1	0	1	1	0	1
1	0	1	0	0	0	0	0	1
1	0	1	1	0	0	0	1	0
1	1	0	0	1	1	1	1	0
1	1	0	1	1	1	1	0	1
1	1	1	0	1	0	1	1	0
1	1	1	1	1	0	1	0	1

3. Determine the minimum SOP expression for the Karnaugh map in Figure 2. (20 points)

Figure 2

The groups of cells are as follows:

AB\CD	00	01	11	10
00	0	1	1	0
01	0	1	1	0
11	0	0	1	0
10	1	0	0	1

Writing the minimized SOP expressions of the groups are:

A'D + BCD + AB'D'