Dean Gadberry
NCTC COSC 2425 S23
3/25/23

Exam 1 - Chapters 1 - 4 & Notes

1. What is 23(base6) minus 23(base4)? Express the answer in base 10.

   $23_6 = 3(6^0) + 2(6^1) = 3 + 12 = 15_{10}$

   $23_4 = 3(4^0) + 2(4^1) = 3 + 8 = 11_{10}$

   $15 + 11 = 26_{10}$

2. Find the value of the following 8-bit two's complement binary number: 11001010

```
11001010 - 1 = 11001001
     Inversion 00110110
00110110 = 2^1 + 2^2 + 2^4 + 2^5 = 2+4+16+32 = 54

11001010 = -54
```

3. Using the Hamming Algorthm with EVEN parity, find the position of the error and the corrected data string.

```
1001 0001 0010

     100100010010
p1 = ? 0 0 0 0 1  = 1
p2 =  ?0  00  01  = 1
p3 =    ?000    0 = 0
p4 =       ?0010 = 1
     12 4   8
     100100010010
     11 0   1
     *X X   *     = 6

bit 6 incorrect

          _
     100101010010
p1 = ? 0 0 0 0 1  = 1
p2 =  ?0  10  01  = 0
p3 =    ?010    0 = 1
p4 =       ?0010 = 1

     12 4 _ 8
     100101010010
     10 1   1

Position of error -> 6
Corrected Data String -> 1001 0101 0010
```

4. List all the ordered pairs that make the following expression true:

   ¬(¬A + ¬B)

   ¬¬A * ¬¬B DeMorgan's

   A * B Double Negation

   The ordered pair that makes this espression true is (1,1)

A	B	Value
0	0	0
1	0	0
0	1	0
1	1	1

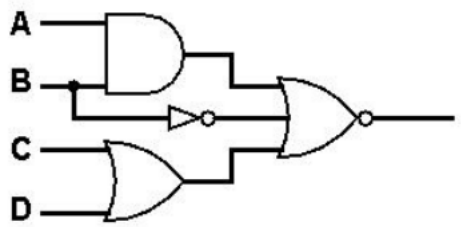
5. Write the Boolean expression in Sum of Product (SOP) form represented by the truth table below

A	B	C	Output
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

6. Write the simplified (minimized) expression for the boolean function defined by the following Karnaugh Map (KMap) in Sum of Product (SOP) form.

wx \ yz	00	01	11	10
00	0	1	0	1
01	0	1	1	1
11	1	1	0	0
10	1	1	0	1

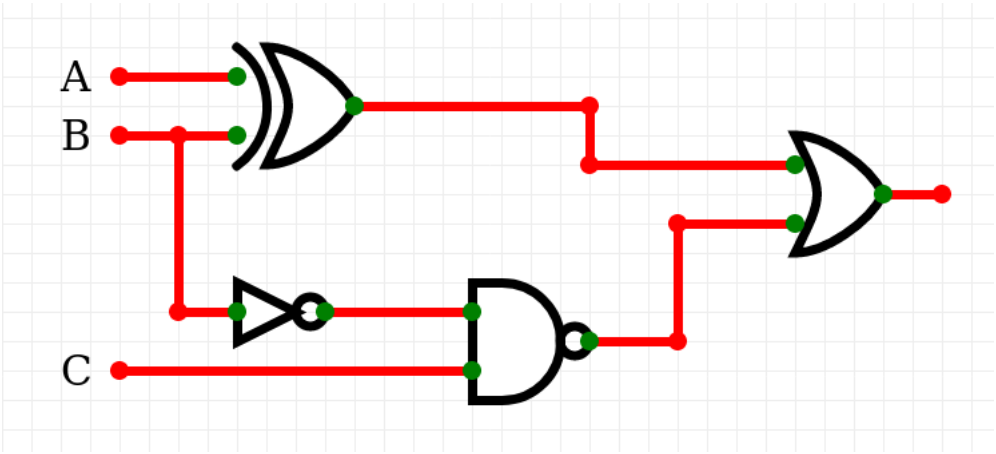
7. What is the Boolean Expression represented by the digital circuit?



$$\neg[(A * B) + \neg B + (C + D)]$$

8. Draw the circuit diagram for the following expression:

   $(A \oplus B) + \neg(\neg B * C)$



9. What is the final value of C when the program is run?

```
A    DC      4       # label A defined as 4
B    DC      120     # label B defined as 120
C    DC      0       # label C defined as 0
TOP  LOAD    C       # C in the accumulator
     ADD     =1      # ACC += 1
     STORE   C       # C = 1
     LOAD    C       # C in ACC
     SUB     A       # ACC = 1 - 4 = -3
     SUB     A       # ACC = -3 - 4 = -7
     SUB     A       # ACC = -7 - 4 = -11
     STORE   B       # B = -11
     LOAD    B       # ACC = -11
     SUB     A       # ACC = -11 - 4 = -15
     BG      TOP     # Does not Branch to TOP because !(ACC>0)
     END             # END

The final value of C is 1
```