EENG 284 – Spring 2024
Exam 1

Name: | | CWID: | |

Clearly circle your answer to each question.

1. **(2 pts.)** Convert 101000_2 to decimal.
   a)20 b)24 c)40 d)42 e) none of the above

2. **(2 pts.)** Convert 42_{10} to binary.
   a) 010010_2 b) 100010_2 c) 100110_2 d) 100100_2 e) none of the above

3. **(2 pts.)** Convert 42_{16} to binary.
   a) 1000010_2 b) 1000100_2 c) 1000110_2 d) 1001000_2 e) none of the above

4. **(2 pts.)** How many bits do you need to represent the number 48?
   a) 4 b) 5 c) 6 d) 7 e) none of the above

5. **(1 pts.)** When representated as 4-bit binary numbers does 12 + 4 generate overflow?
   a) yes b) no c) Trick question, 12 cannot be represented in 4-bit

6. **(2 pt.)** Which expression is equivalent to (A'+B)'(B+AC)?
   a) 0
   b) 1
   c) AB'C
   d) AB' + AB'C
   e) None of the above

For questions 7-10 let F(A,B,C)= A'B + A(B'+ BC')

7. **(2 pts.)** What does F(0,1,0) equal?

   a) 0 b) 1 c) C d) C' e) none of these

8. **(1 pts.)** What does F(1,1,C) equal?

   a) 0 b) 1 c) C d) C' e) none of these

9. **(2 pt.)** How many AND gates does it take to realize F as is (do not simplify)?

   a) 1 b) 2 c) 3 d) 4 e) none of these

10. **(2 pt.)** How many OR gates does it take to realize F as is (do not simplify)?

    a) 1 b) 2 c) 4 d) 5 e) none of these

Utilize the following truth table for problems 11 and 12.

A	B	C	F	G
0	0	0	1	1
0	0	1	0	0
0	1	0	0	0
0	1	1	0	1
1	0	0	1	1
1	0	1	1	0
1	1	0	0	1
1	1	1	0	1

11. **(2 pt.)** What function is described by $\prod M(0,3,4,6,7)$?

    a) F b) F' c) G d) G' e) none of the above

12. **(2 pt.)** How many sum terms does the canonical POS expression for F have?

    a) 1 b) 2 c) 3 d) 4 e) 5

13. **(3 pts.)** How many different SOP_{min} solutions exist for F(A,B,C)=Σm (1,3,4,5,6) ?

    a) 1 b) 2 c) 3 d) 4 e) 5

$A\backslash BC$	00	01	11	10
0				
1				

Utilize the following word statement for problems 14 and 15.

Design a 4-input $a_1a_0b_1b_0$, two output o_1o_0 digital circuit. $A = a_1a_0$ and $B = b_1b_0$ represent 2-bit binary numbers. The output is the smaller (or either if a same) of A and B. For example, if $A = 10$ and $B = 01$, then $O = 01$.

14. **(2 pt.)**How many rows of the truth table have $O_1 = 1$?

    a) 1 b) 4 c) 9 d) 12 e) None of the above.

15. **(2 pt.)**How many rows of the truth table have $O_0 = 0$?

    a) 1 b) 4 c) 9 d) 12 e) None of the above.

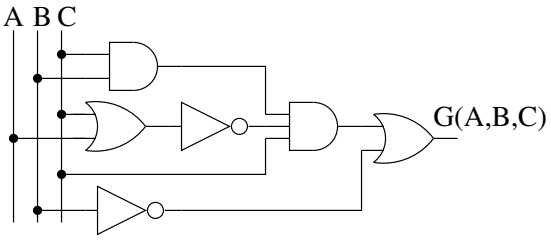
16. **(1 pt.)**A grouping of 4 cells generates a product term with 4 variables. How many variables does the kmap have?

    a) 3 b) 4 c) 5 d) 6 e) None of the above.

a_1	a_0	b_1	b_0	o_1	o_0
0	0	0	0		
0	0	0	1		
0	0	1	0		
0	0	1	1		
0	1	0	0		
0	1	0	1		
0	1	1	0		
0	1	1	1		
1	0	0	0		
1	0	0	1	0	1
1	0	1	0		
1	0	1	1		
1	1	0	0		
1	1	0	1		
1	1	1	0		
1	1	1	1		

Truth Table for O

For questions 17,18 use the figure below.



17. **(2 pt.)** What is the symbolic representation of $G(A, B, C)$ (do not simplify).

    a) BC + (A + C)' + B'

    b) BC(A+C)' + B'

    c) BC(A+C)'C + B'

    d) B'

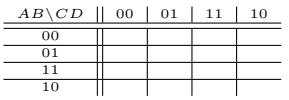
    e) None of the above.

18. **(2 pt.)** What is G(1,1,0)=?

    a) 1

    b) 0

19. **(3 pts.)** Determine the SOP_{min} expression for F(A,B,C,D)=$\sum m(1,5,7,8,9,14) \sum d(0,6,12,13)$



a) AC' + C'D + A'BC + BCD'

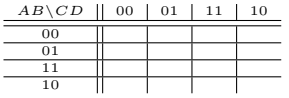
b) B'C' + A'BD + BCD'

c) A'C'D + BCD' + B'C'

d) B'C'D' + B'C'D + A'BD + BCD'

e) None of the above.

20. **(3 pt.)** Determine the SOP_{min} expression for F(A,B,C,D)= AB'C' + A'B'D + CD + A'B'CD'



a) A'B'D + A'B'C + ACD + AB'C'D' + AB'CD'

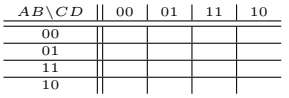
b) A'B'C + AB'C'+ B'D + CD

c) A'B'C + A'BD + AB'C'+ AB'D + CD

d) A'B' + AB' + CD

e) None of the above.

21. **(3 pt.)** Determine the POS_{min} expression for F(A,B,C,D)= (A+B'+D)(B+C')(B'+C'+D)



a) (B+C')(A+B'+D')(C'+D)

b) (B+C'+D')(C'+D)(A+B'+D)

c) (A+B'+D)(B+C')(B'+C'+D)

d) (B+C)(A'+C)(B+D)

e) None of the above.