CMPEN 271 – Fall 2011

Return this exam! No calculators!

Exam 1

Name: ID:

1. **($2*10^6$ pts.)** Convert 101011_2 to decimal.

    a) 16   b) 24   c) 42   d) 84   e) none of the above

2. **($2*10^6$ pts.)** Convert 35_{10} to binary.

    a) 110101_2 b) 010111_2 c) 111111_2 d) 100011_2 e) none of the above

3. **($2*10^6$ pts.)** Convert 35_{16} to decimal.

    a) 24   b) 35   c) 48   d) 53   e) none of the above

4. **($2*10^6$ pts.)** What is the largest number that you can make with N-bits?

    a) $log_2(N)$ b) N c) N^2 d) $2^N - 1$ e) none of the above

For questions 5-8 assume F(A,B,C)= ((A'B)'C + (BC')')'

5. **($2*10^6$ pts.)** What does F(0,1,0) equal?

    a) 0

    b) 1

    c) C

    d) C'

    e) Not enough information.

6. **($2*10^6$ pts.)** What does F(1,1,C) equal?

    a) 0

    b) 1

    c) C

    d) C'

    e) Not enough information.

7. **(1∗10⁶ pt.)** How many OR gates does it take to realize F as is (do not simplify)?

    a) 1

    b) 2

    c) 3

    d) 4

    e) None of the above.

8. **(2∗10⁶ pts.)** 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 the above.

Utilize the following truth table for problems 9-12.

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

9. **(1∗10⁶ pt.)** What function is described by $\sum m(0,3,4,6,7)$?

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

10. **(1∗10⁶ pt.)** What function is described by $\prod M(0,4,5)$?

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

11. **(1∗10⁶ pt.)** How many product terms does the <u>canonical SOP</u> expression for F' have?

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

12. **(1∗10⁶ pt.)** How many sum terms does the <u>canonical POS</u> expression for G have?

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

Utilize the following circuit diagram for problems 13,14.
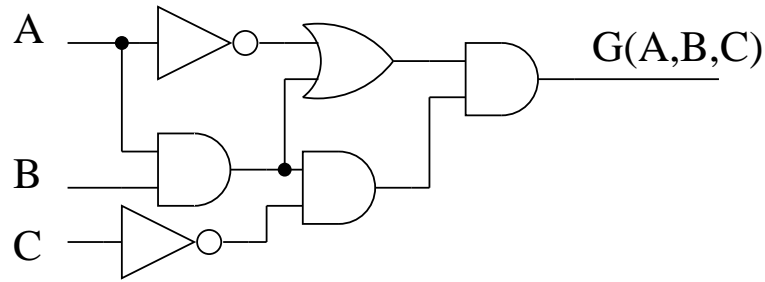
13. ($4*10^6$ **pts.**) What is the symbolic representation of $G(A, B, C)$ as shown?

    a) ABC'(A'+AB)

    b) (AB+A')C'

    c) (A'+AB)BC'

    d) ABC'

    e) None of the above.

14. ($2*10^6$ **pts.**) What does G(0,1,0) equal?

    a) 0   b) 1

15. ($1*10^6$ **pt.**) Which of the following should be avoided.

    a) Connecting outputs together.

    b) Connecting inputs together.

    c) Having a single output drive multiple inputs.

    d) Connecting wires together.

    e) Connecting an input to an output.

16. ($1*10^6$ **pt.**) Which expression is equivalent to (AB')'(B'+AC)? Hint, use De Morgans, distribute, and simplify.

    a) 0

    b) AB' + AB'C

    c) AB' + AC + B' + AB'C

    d) A'B' + ABC

    e) None of the above.

Utilize the following word statement for problems 17-19.

Design a 4-input $a_1a_0b_1b_0$. $A = a_1a_0$ and $B = b_1b_0$ represent 2-bit binary numbers. The output should be the product (multiplication) of the inputs, that is $O = A * B$.

17. **($1*10^6$ pt.)**How many bits of output must the circuit have?

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

18. **($1*10^6$ pt.)**How many rows will the truth table have?

   a) 4   b) 8   c) 16   d) 32   e) None of the above.

19. **($1*10^6$ pt.)**How many rows of the truth table will have $o_0 = 1$? Note that o_0 is the least significant bit of the output.

   a) 1   b) 3   c) 9   d) 12   e) None of the above.

20. **($1*10^6$ pt.)** A cell in a 8 variable kmap is adjacent to how many other cells?

   a) 3

   b) 8

   c) 16

   d) 64

   e) 256

21. **($2*10^6$ pts.)** How many different SOP_{min} solutions exist for $F(A,B,C)=\Sigma m(0,2,5,6,7)$?

   a) 1

   b) 2

   c) 3

   d) 4

   e) 5

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

22. **($4*10^6$ pts.)** Determine the SOP_{min} expression for $F(A,B,C,D)=\sum m(0, 1, 5, 6, 7, 8, 9, 14)$

   a) A'B'C' + A'BD + BCD' + AB'C'

   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.

$AB \backslash CD$	00	01	11	10
00				
01				
11				
10				

23. **($4*10^6$ pts.)** Determine the SOP_{min} realization for F.

A	B	C	F
0	0	X	1
1	0	0	0
1	1	X	X
0	X	0	1
1	0	1	0
X	1	1	X

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

    a) A'+ B

    b) A+BC'

    c) A + C'

    d) A'BC' + A'B'

    e) None of the above.

24. **($6*10^6$ pts.)** Determine the POS_{min} expression for
    $F(A, B, C, D) = (A' + D)(A' + B' + C')(A + B + D')(B' + C' + D')$, show
    your work.

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