Name _____

COE/EE 243 **from Fall 98**

Sample Exam

Solutions

Combination of questions from 2 exams so doesn't add up to 50 points

1. (5 pts) The maxterm expansion for $F = xy + x'z$ is:
   $F = xyz + xyz' + x'yz + x'y'z$

   $= \sum m(1,3,6,7)$
   $= \prod M(0,2,4,5)$
   $= (x+y+z)(x+y'+z)(x'+y+z)(x'+y+z')$

   (b) $(x+y+z)(x+y'+z)(x'+y+z)(x'+y+z')$

2. (5 pts) Multiply $F(A,B,C,D,E) = (AB+C+D)(C'+D)(C'+D+E)$ out and simplify to obtain the sum of 2 products
   $= (AB+C+D)(C'+D)$

   $= ABC' + ABD + C'D + CD + D$
   $= ABC' + D(AB + C' + C + 1)$
   $= ABC' + D$

   (a) $ABC' + D$

3. (5 pts) The complement of $F_1 = x(y'z' + yz)$ is:

   (b) $x' + (y+z)(y'+z')$

4. (4 pts) The minterm expansion for
   $F(A,B,C) = (A+B+C)(A+B'+C')(A'+B+C')(A'+B'+C)$ is:

   $= \prod M(0,3,5,6)$ so the minterm expansion is

(c) $F(A,B,C) = \sum m(1,2,4,7)$

5. (4 pts) A circuit with three inputs, A,B, and C, is tested for all combinations of inputs. The output is "1" when exactly one of the inputs is "1". This circuit can be represented by the which of the following boolean expressions (assume positive logic):
   Output is "1" for the following three combinations:

   $(A=1,B=0,C=0)$, $(A=0,B=1,C=0)$, and $(A=0,B=0,C=1)$

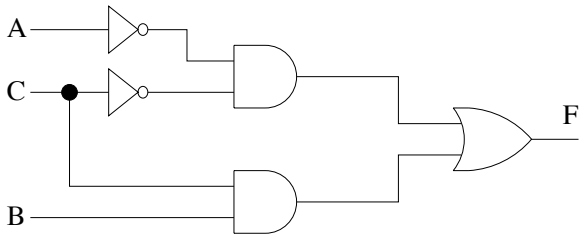
   (c) $f(A,B,C) = A'B'C + A'BC' + AB'C'$

6. (5 pts) Simplify $F(A,B,C) = \prod M(1,4,5,6)$ to a product of 2 sums:
   $F(A,B,C) = (A+B+C')(A'+B+C)(A'+B+C')(A'+B'+C)$

   $= (A+B+C')(A'+B+C')(A'+C)$
   $= (B+C')(A'+C)$

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

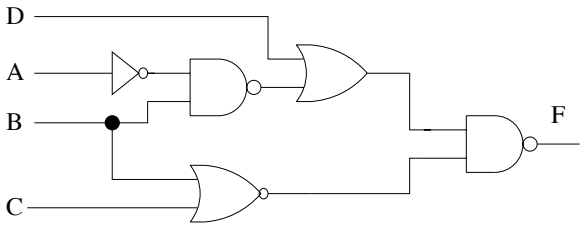
7. (5 pts) The minterm expansion for F(A,B,C) in the diagram below is:



   $F = ((A'C')')' + ((B+C)')'$
   $= A'C' + BC$
   $= A'B'C' + A'BC' + A'BC + ABC$

   (d) $A'B'C' + A'BC' + A'BC + ABC$

8. (5 pts) The minimum expression for the network shown below is:



$F = ((D+(A'B)')(B+C)')'$
$= (D+(A'B)')'+(B+C)$
$= D(A'B)+B+C$
$= B(DA'+1)+C$
$= B+C$

(d) $B+C$

9. (6 pts) Complete the following table of equivalent values.

Binary	Octal	Decimal	Hexadecimal
1101.0101	**15.24**	**13.3125**	**D.5**
11111.01	**37.2**	31.25	**1F.4**

10. (6 pts) Calculate the following
    a) $(10111)_2$ times $(110)_2$
       = 10001010
    b) $(1001)_2$ minus $(0110)_2$
       = 0011

11. (12 pts) Calculate the following
    a) $(11001)_2$ plus $(101)_2$ $= 11110$
    b) $(11010)_2$ minus $(10101)_2$ using 1's complement representation $= 000101$
    c) $(1101)_2$ times $(1001)_2$ $= 1110101$
    d) $(101101)_2$ divided by $(110)_2$ $= 111.1$

12. (9 pts) Complete the following table of equivalent values. Use binary numbers with a sign bit and 5 bits for the value

Decimal	Signed Magnitude	Two's Complement	One's Complement
−11	101011	110101	110100
−2	100010	111110	111101
−1	100001	111111	111110