Bring this homework to class on Tuesday Sept. 11, but do not turn it in until the end of class.

#1. Using DeMorgan's Theorem, express the function as indicated.

F(A,B,C) = AC' + A'C' + BC'

a. With only OR and Complement operations: ______ F(A,B,C) = (A'+C)' + (A+C)' + (B'+C)' __

F(A,B,C) = ((AC')' (A'C')')' + BC'

b. With only AND and Complement operations: __ F(A,B,C) = ((AC')' (A'C')' (BC')')' _______

#2. In order to design a single stage logic circuit, we need to express the logic function so that only single literals are complemented [no complemented parentheses like (A+B)']. Express the following logic functions that way (use DeMorgan's theorem):

(A'+ B)'C + ((D + E')F)' = AB'C + (D+E')' + F' '= AB'C + D'E + F'

(AB(C + D)')' = (AB)' + C + D = A' + B' + C + D

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

#3. For the truth tables below, express the minterm sum of products, and the maxterm product of sums:

A	B	C	F
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	0

sum of products F(A,B,C) = A'B'C + A'BC + AB'C' + ABC' = m1 + m3 + m4 + m6

product of sums F(A,B,C) = (A+B+C) (A+B'+C) (A'+B+C') (A'+B'+C') = M0 M2 M5 M7

#3. For the truth tables below, fill in the Karnaugh map

A	B	C	F
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	0

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

minterm indices ___1, 3, 4, 6____ [for all 1's, index = 4A + 2B + C]
maxterm indices ___0, 2, 5, 7____ [for all 0's, index = 4A + 2B + C]

#4. For the Karnaugh map below, circle the Prime Implicants and label the Essential Prime Implicants with "EPI".

EPI = B'D'

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

EPI = BC'D

EPI = A'C'

Write the reduced logic expression: B'D' + A'C' + BC'D + AB'C' [AC'D could replace AB'C']

maxterm indices (decimal) 1, 4, 11, 12, 14, 15

#5. Express the following as a sum of products (minterms) and as a product of sums(maxterms).

F(A,B,C) = (AB’ +BC) (AC + AB’C)

= AB’AC + AB’AB’C + BCAC + BCAB’C

= AB’C + AB’C + ABC + 0

SOP: = AB’C + ABC

= m5 + m 7 [101, 111]

F(A,B,C) = (AB’ +BC) (AC + AB’C)

= (AB’ + B) (AB’ + C) (AC + AB') (AC + C) (AB’ + B) = (A + B)

= (A + B) (A + C) (B’ + C) A (C + B') C (AC+C) = C

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

A = (A+B+C) (A+B+C’) (A+B’+C) (A+B’+C’)

= (A+B+C)(A+B+C’) (A+B+C) (A+B’+C) (A+B’+C) (A’+B’+C)

(A+B+C) (A+B+C’) (A+B’+C) (A+B’+C’) (A+B+C) (A+B’+C) (A’+B+C) (A’+B’+C)

POS = (A+B+C) (A+B+C’) (A+B’+C) (A+B’+C’) (A’+B+C) (A’+B’+C)

= M0 M1 M2 M3 M4 M6