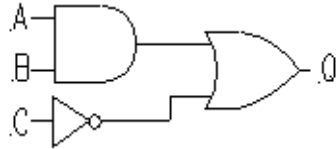


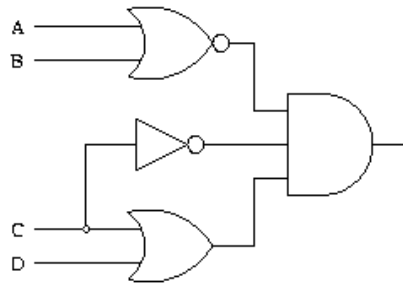
CS 231: Logic Problems

1) Write an expression for output Q, in terms of the inputs A, B and C:

a)



b)



2) Draw a Circuit for each expression using AND, OR, and Inverter gates:

a) $Q = A + B \cdot C$

b) $Q = AB + \overline{AC}$

c) $Q = (A+B)(A+C)$

3) For the first expression in Problem 2 :

a. Draw a circuit using only AND and Inverter gates:

b. Write a truth table for the expression, and express Q in Sum of Products and Product of Sums:

4) Simplify the following Expression: $\overline{AB}(\overline{A} + B)(\overline{B} + B)$

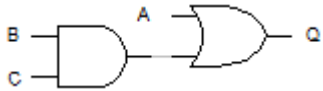
SOLUTIONS

1) a) $Q = AB + \bar{C}$

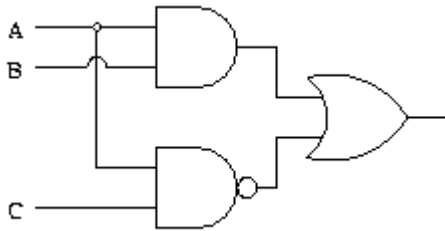
b) $Q = \overline{(A+B)}(C+D)\bar{C}$

2)

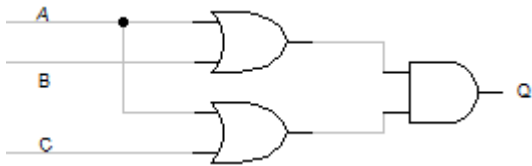
a)



b)

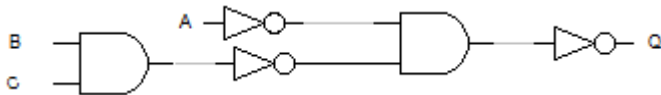


c)



3)

a)



b)

A	B	C	Q
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	1

SOP (Add minterms): $Q = \overline{A}BC + A\overline{B}C + A\overline{B}C + ABC + ABC$

POS (Multiply maxterms, minterms of the compliment): $Q = (A + B + C)(A + B + \overline{C})(A + \overline{B} + C)$

4) $\overline{AB}(\overline{A} + B)(\overline{B} + B)$

$\overline{AB}(\overline{A} + B)$ Complement Law

$(\overline{A} + \overline{B})(\overline{A} + B)$ DeMorgan's Law

$\overline{A} + \overline{B} B$ Distributive Law

\overline{A} Complement Law