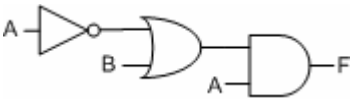
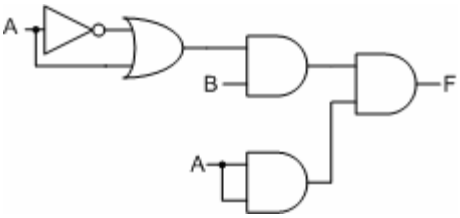
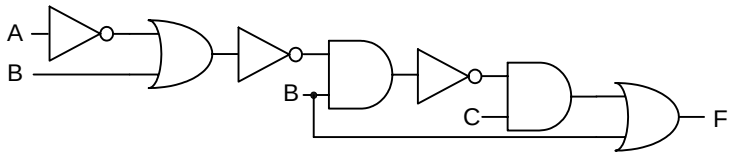
EEC 180A Practice Problems

1. Are these gate networks equivalent?





2. Find the output **F** of the gate network:



F=

3. Use Boolean algebra to show that:

F = (A'+B'+D')(A'+B+D')(B+C+D)(A+C')(A+C'+D) = A'C'D+ACD'+BC'D'

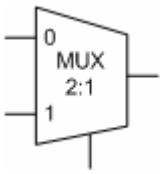
4. Simplify the following expression using Boolean algebra:

F=BC'D'+ABC'+AC'D+AB'D+A'BD'

5. Find the minimum sum of products using Karnaugh-maps.
Note: D's are don't-care values.

f(a, b, c, d) = Π M(0, 1, 5, 8, 9, 10, 11, 15) • Π D(6, 12)

6. Realize the function **f = a'b+ab'** using 2:1 MUX



7. Implement the function **f** using a **<u>minimum</u>** number of 2-input AND and 2-input OR gates:

f = ab'c' + a'bc + a'c + ab

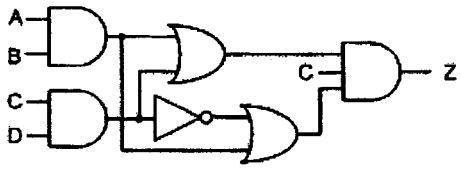
8. Using only NAND gates: minimize the total number of gates used to implement the 2-output gate network for f and g:

Note: Assume you have the true and complement of each input available (i.e. a and a')

f = a'c + b'c + a'd'
g = c'd' + ab' + ac'

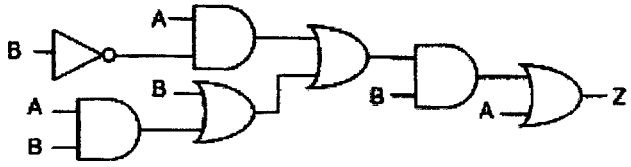
9.

(a) Simplify the following network to a single gate:



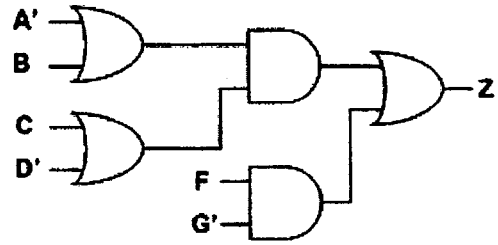
Z =

(b) Find the output Z and design a simpler network having the same output:

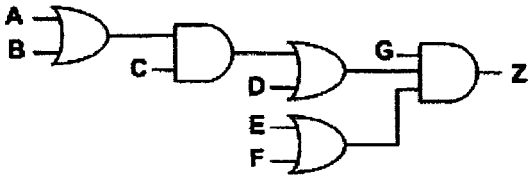


10.

a) Convert the following circuit to all NAND gates



b) Convert the following circuit to all NOR gates

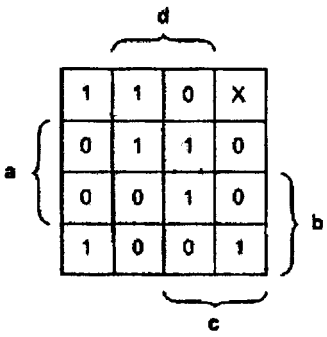


11.

Simplify the expression using the consensus theorem

F=A'C'+ACD+BC'D+AB'C+ABD

12.



a) Find the minimum sum of products for f given in the Karnaugh-map:

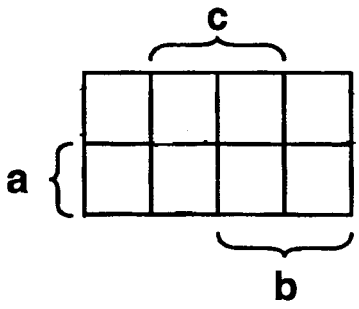
b) Find the minimum product of sums for f given in the Karnaugh-map:

13.

Simplify function f(a, b, c) defined in the truth-table below using Karnaugh-maps and realize it (i.e. draw the circuits) using only: (a) 2-input NAND gates and (b) 2-input NOR gates

a	b	c	f
0	0	0	1
0	0	1	1
0	1	0	1
0	1	1	0
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	0

a) Realize the function using 2-input NAND gates



b) Realize the function using 2-input NOR gates