University of Guyana
Faculty of Technology

EMT 121 - Boolean Algebra Problems

May 10, 2012

1. An engineer hands you a piece of paper with the following Boolean expression on it, and tells you to build a logic gate circuit to perform that function:

$$A\bar{B} + \bar{C}(A + B)$$

   Draw a logic gate circuit for this function.

2. Use Boolean algebra to simplify the following expressions, then draw logic circuits for the simplified expressions:

   (a) $A(B + AB) + AC$

   (b) $(A + B)(\bar{A} + \bar{B})$

   (c) $\bar{A}\bar{B}\bar{C} + \bar{A}\bar{B}C + A\bar{B}\bar{C} + A\bar{B}C$

3. Use DeMorgan's Theorem, as well as any other applicable rules of Boolean algebra, to simplify the following expressions:

   (a) $\overline{\overline{AB} + \overline{AC}}$

   (b) $\overline{\overline{AB\bar{C}}B}$

   (c) $\overline{\overline{X + Y}XZ}$

4. Draw truth tables for the following:

   (a) $A + BC$.

   (b) $(A + B)(A + C)$

5. Draw logic circuits for the following:

   (a) $(A + B)C$

   (b) $A + BC + \overline{D}$

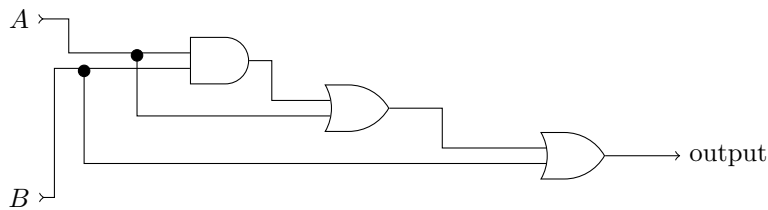6. Convert the following truth table to SOP and POS expressions.

A	B	Z
0	0	1
0	1	0
1	0	0
1	1	0

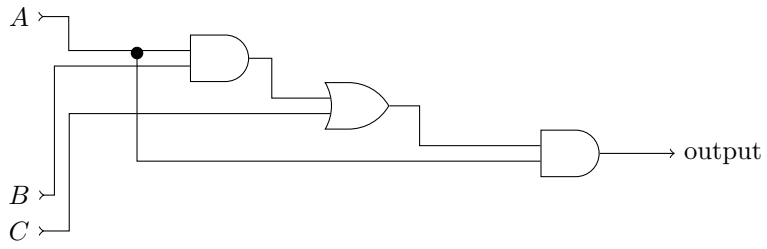Here A and B are inputs and Z is the output.

7. Suppose you needed an inverter gate in a logic circuit, but none was available. You do, however, have a spare NAND gate in one of the integrated circuits. Show how you would connect a NAND gate to function as an inverter.

8. Show how you would connect a NOR gate to function as an inverter.

9. NAND and NOR gates both have the property of universality. That is , it is possible to create any logic function using nothing but multiple gates of either type. Convert the following gate circuit diagram into one built exclusively of NAND gates. Then, do the same using nothing but NOR gates.
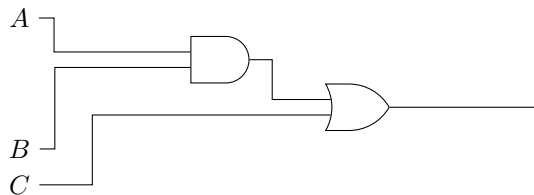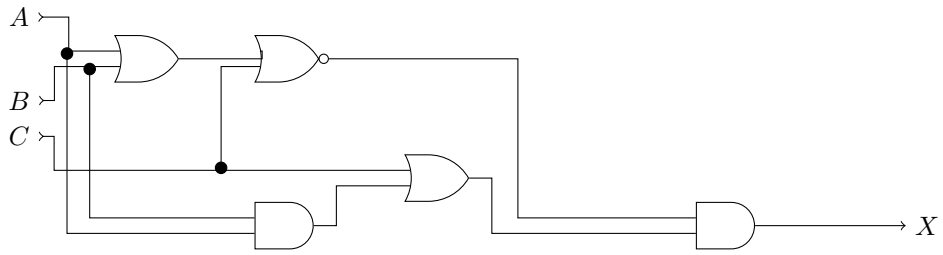

10. Use Boolean Algebra to simplify the following logic gate circuits.
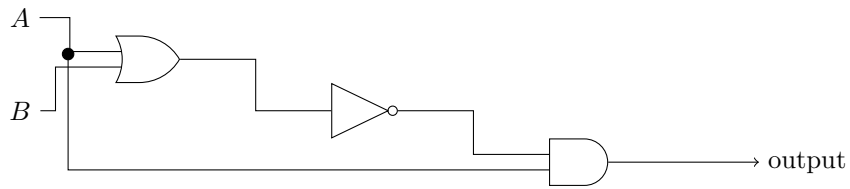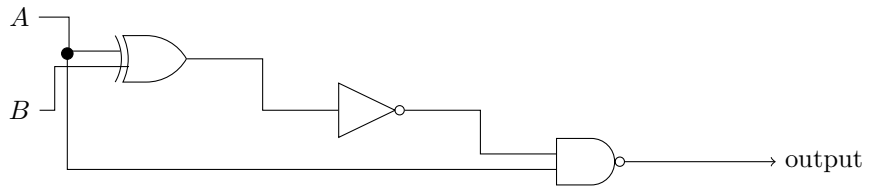

Circuit 1

2

A ⊳

B ⊳

C ⊳

→ output

Circuit 2

A ⊳

B ⊳

C ⊳

→ X

Circuit 3

A

B

→ output

Circuit 4

A

B

→ output

Circuit 5

3