Logic Gates

Objectives:

The main purpose for this lesson is to introduce the following:

- define some important concepts of logic gates.
- Basic types of gates and drawings.

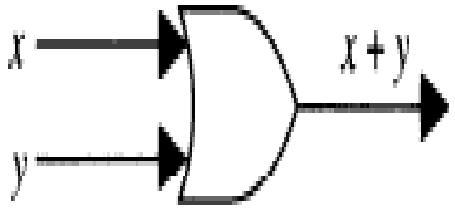
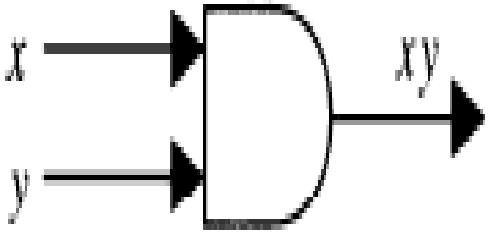
Introduction

- Boolean algebra is used to model the circuitry of electronic devices.
- Each input and each output of such a device can be thought of as a member of the set {0,1}.

The basic elements of circuits are called ***gates***.

- Each type of gate implements a Boolean operation.
- The circuits that we will study in this chapter give output that depends only on the input, and not on the current state of the circuit. Such circuits are called ***combinational circuits*** or ***gating networks.***

Basic Types of Gates

Gate	Input	Output	Figure
Inverter	A value of *one* Boolean variable	The *complement* of the value	
The OR gate	The values of *two or more* Boolean variables	The Boolean *sum* of their values	
The AND gate	the values of *two or more* Boolean variables	the Boolean *product* of their values	

Basic Types of Gates

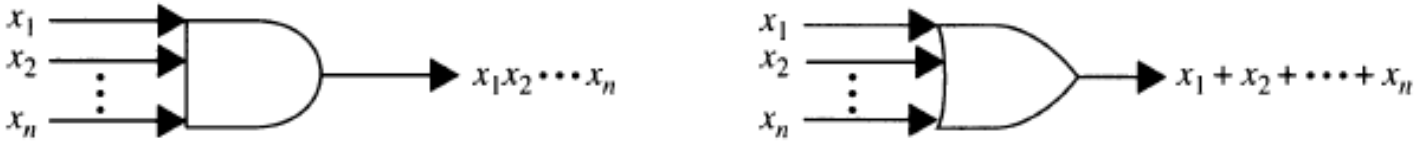
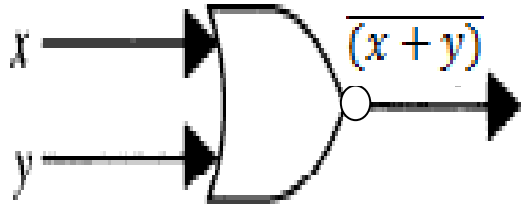
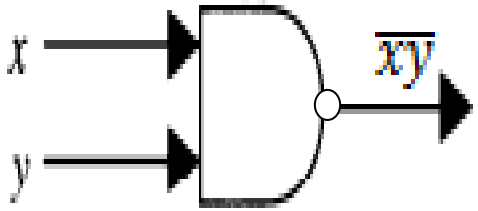


FIGURE 2 Gates with *n* Inputs.





Combinations of Gates

- Combinational circuits can be constructed using a combination of ***inverters, OR gates***, and ***AND gates***.
- output from a gate may be used as input by one or more other elements
- Both drawings in Figure 3 depict the circuit that produces the output $xy + \bar{x}y$

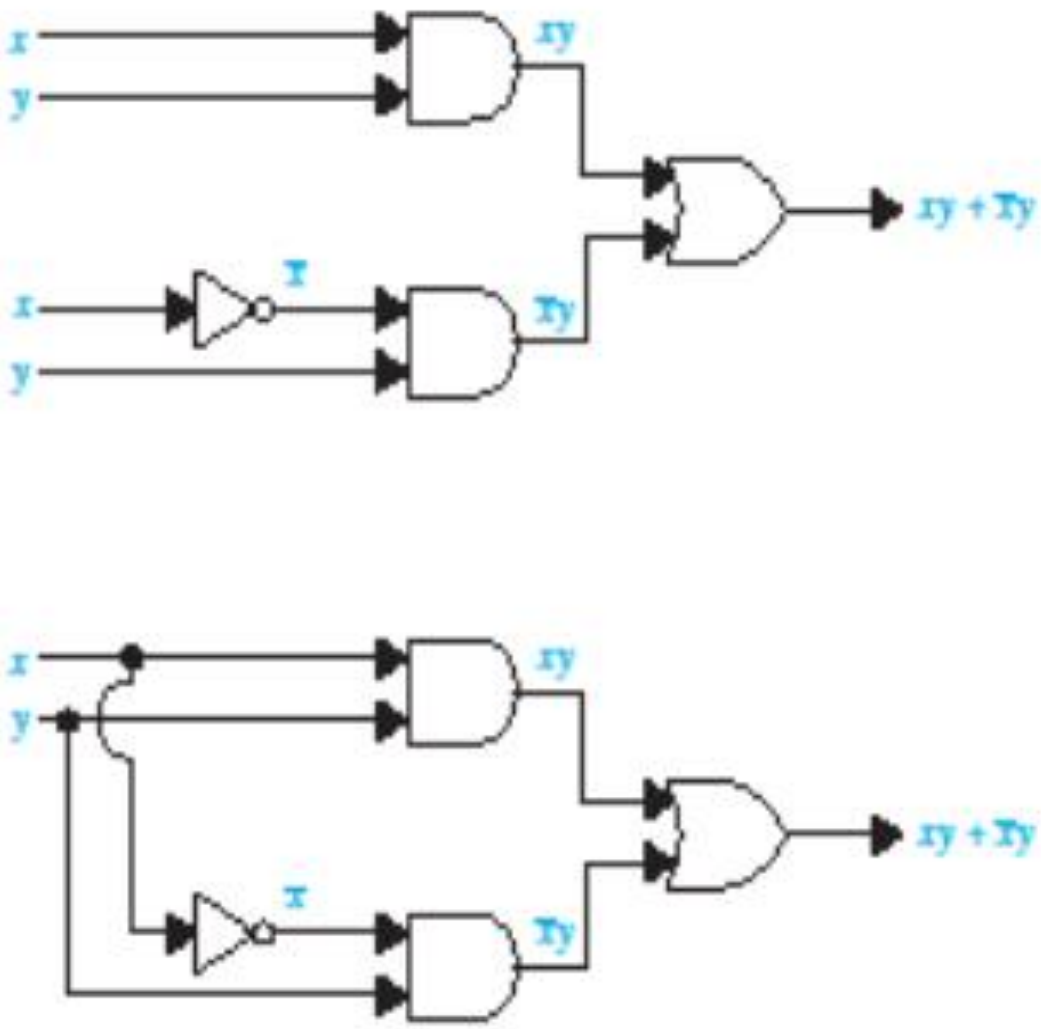


FIGURE 3 **Two Ways to Draw the Same Circuit.**

EXAMPLE 1

Construct circuits that produce the following outputs:

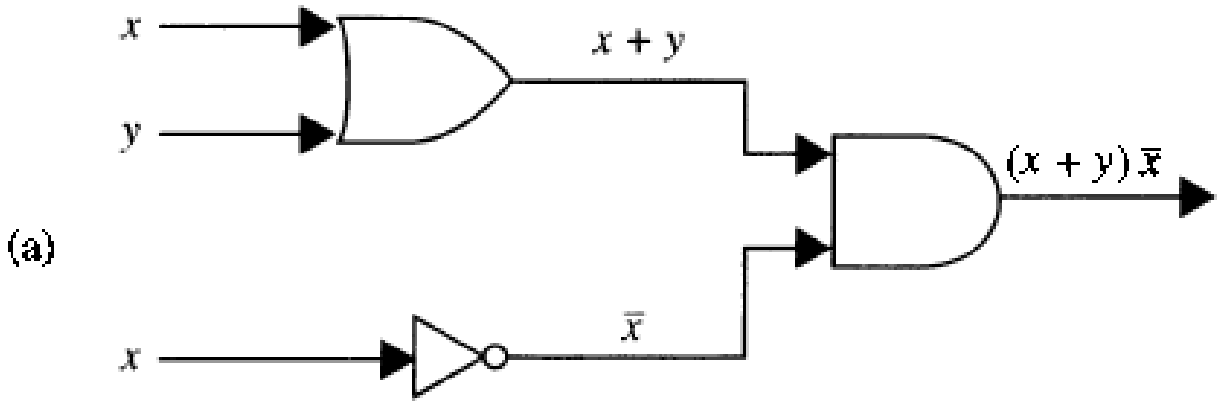
$(a)\ (x+y)\bar{x}$

$(b)\ \bar{x}\overline{(y+\bar{z})}$

$(c)\ (x+y+z)(\bar{x}\bar{y}\bar{z})$

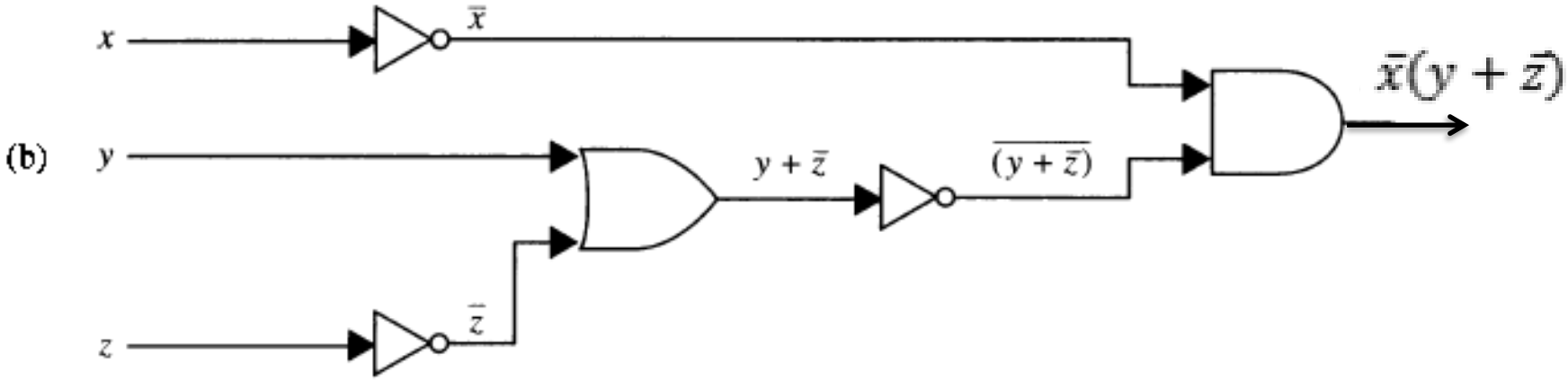
Solution

$(a)\ (x+y)\bar{x}$



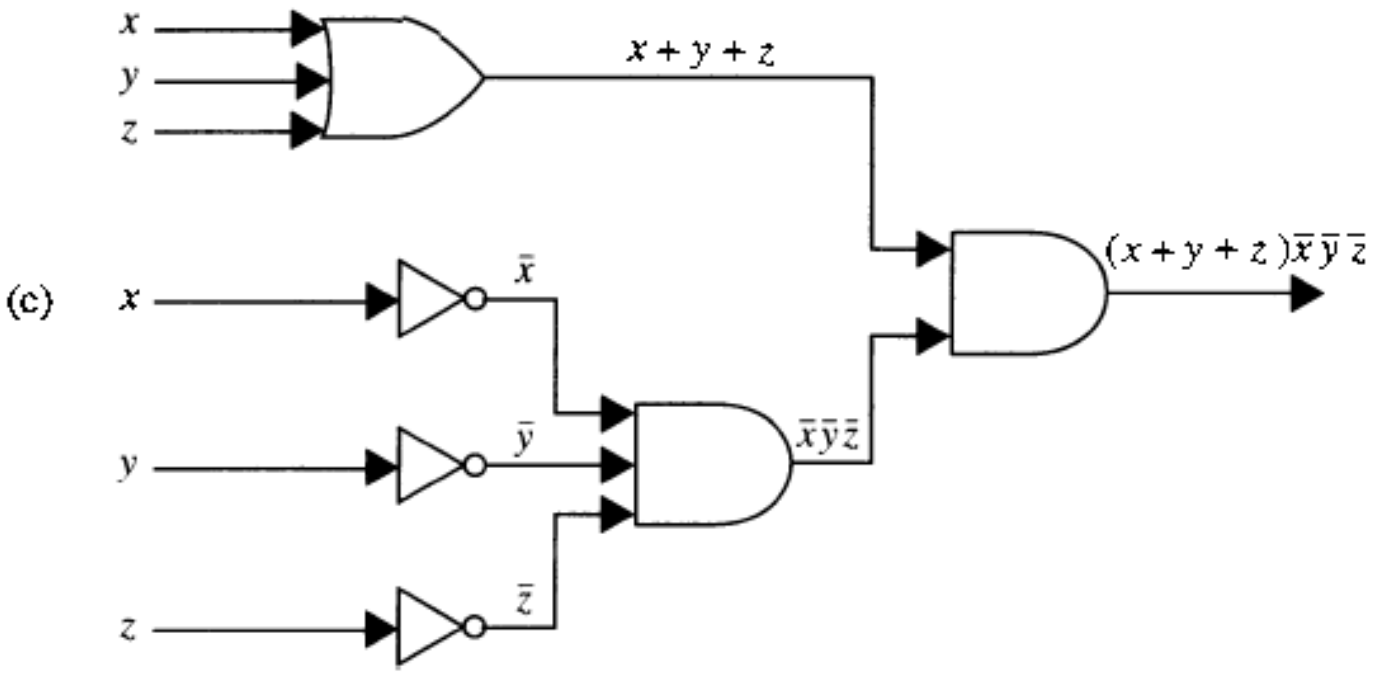
Solution

$(b)\ \bar{x}\overline{(y+\bar{z})}$



Solution

(c) $(x + y + z)(\bar{x}\bar{y}\bar{z})$



Homework

Page 827/828

- 1
- 3
- 5