Computer Fundamentals

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Lecture 7

Number System Conversion

- ➤ Direct conversions possible for
  - ❑ Binary to octal and vice versa
  - ❑ Binary to hexadecimal and vice versa
  - ❑ Decimal to octal and vice versa
  - ❑ Decimal to hexadecimal and vice versa
- ➤ Numbers with other bases
  - ❑ ???

Decimal – Octal Conversion

➢ Convert $(75)_{10}$ to octal

8	75	remainder
8	9	3
8	1	1
	0	1

$(113)_8$

Decimal – Octal Conversion (cont.)

➢ Convert 113 from octal to decimal

$(113)_8$ $= 1 \times 8^2 + 1 \times 8^1 + 3 \times 8^0$

          $= 64 + 8 + 3$

          $= (75)_{10}$

Decimal – Hexadecimal Conversion

➢ Convert $(75)_{10}$ to hexadecimal

16	75	remainder
16	4	B
	0	4

$(4B)_{16}$

Decimal – Hexadecimal Conversion (cont.)

➢ Convert 4B from hexadecimal to decimal

$(4B)_{16}$ = $4 \times 16^1 + 11 \times 16^0$

                       =   64   +   11

                       = $(75)_{10}$

Numbers with Other Bases

- ➢ Numbering systems possible with other bases
  - ❑ Base 3, 4, 5 etc.
- ➢ Conversion to decimal or any other base possible

➢ Base 3 numbers expressed in positional notation

The right-most is the least significant digit

$$1202 = 1 \times 3^3 + 2 \times 3^2 + 0 \times 3^1 + 2 \times 3^0$$

The left-most is the most significant digit

➤ Constituents of a decimal number

1

$$1202 = 1 \times 3^3 + 2 \times 3^2 + 0 \times 3^1 + 2 \times 3^0$$

1's multiplier

➢ Constituents of a decimal number

$$1202 = 1 \times 3^3 + 2 \times 3^2 + 0 \times 3^1 + 2 \times 3^0$$

3

3's multiplier

➢ Constituents of a decimal number

$$9$$

$$1202 = 1 \times 3^3 + 2 \times 3^2 + 0 \times 3^1 + 2 \times 3^0$$

9's multiplier

➢ Constituents of a decimal number

27

$$1202 = 1\text{x}3^3 + 2\text{x}3^2 + 0\text{x}3^1 + 2\text{x}3^0$$

27's multiplier

➢ Convert 75 from decimal to base 3

3	75	remainder
3	25	0
3	8	1
3	2	2
	0	2

$(2210)_3$

➢ Convert 2210 from base 3 to decimal

$(2210)_3$ $= 2 \times 3^3 + 2 \times 3^2 + 1 \times 3^1 + 0 \times 3^0$

                $= 54 + 18 + 3 + 0$

                $= 75$

Exercise

➢ Convert $(95)_{10}$ to base 2, base 3 and base 16 numbers
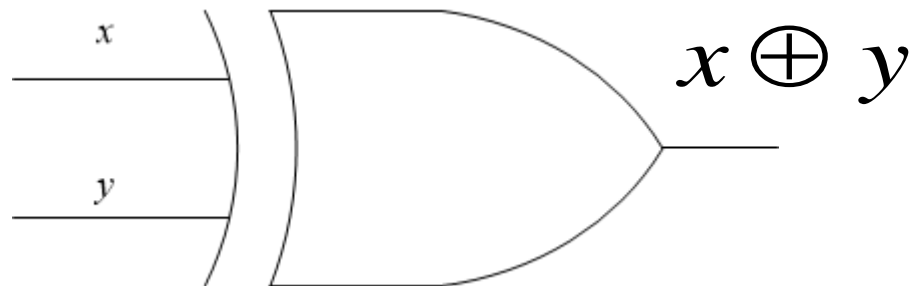
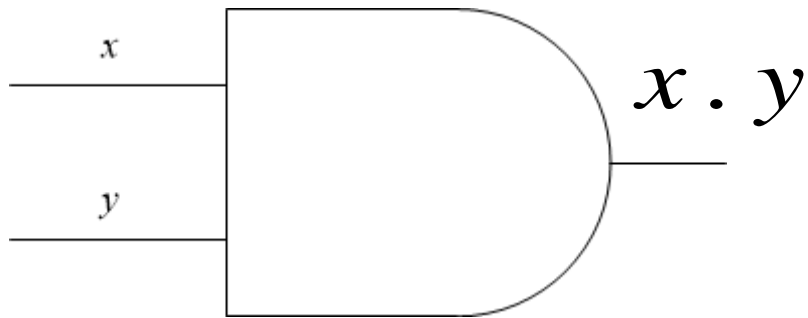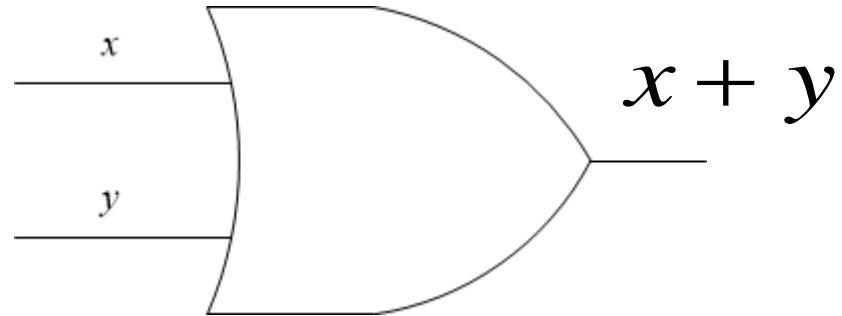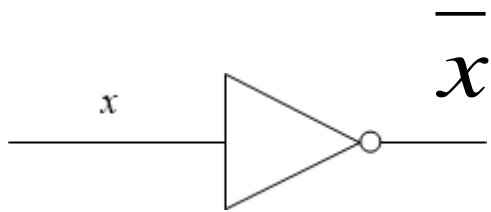# Logical Operations Revisited

➢ Truth table for three or more input variables
  ❑ Follow stepwise approach

x	y	z	$x \oplus y$	$(x \oplus y).z$
0	0	0	0	0
0	0	1	0	0
0	1	0	1	0
0	1	1	1	1
1	0	0	1	0
1	0	1	1	1
1	1	0	0	0
1	1	1	0	0

➢ Graphical depiction of boolean expression

$\overline{x}$

$x + y$

$x \cdot y$

$x \oplus y$

➢ Draw diagram for representation of boolean expression

$$(x \oplus y).z$$
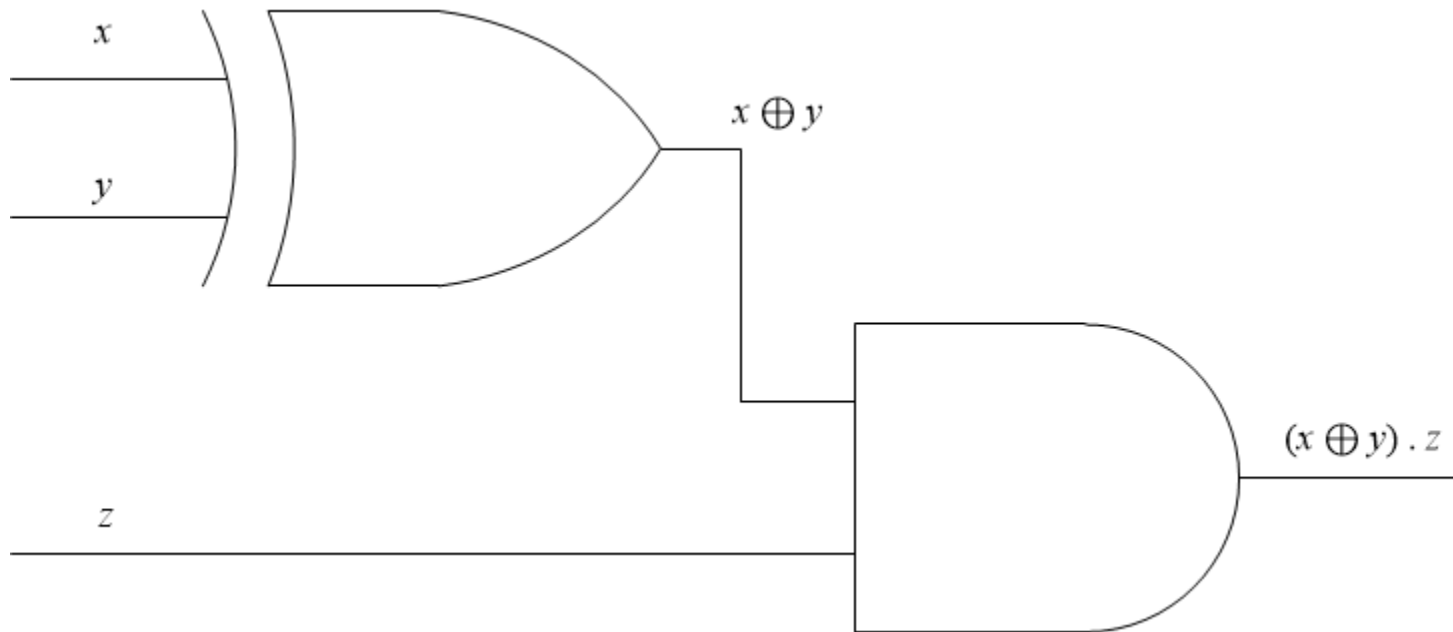
Exercise

➤ Derive truth table for $(x + y) \oplus z$

x	y	z		
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

➢ Draw diagram of boolean expression

$$(x + y) \oplus z$$

➢ Derive truth table for $\overline{(x+y)} \oplus \bar{z}$

x	y	z				
0	0	0				
0	0	1				
0	1	0				
0	1	1				
1	0	0				
1	0	1				
1	1	0				
1	1	1				

➢ Draw diagram for representation of boolean expression

$$\overline{(x + y)} \oplus \overline{z}$$

- ➤ Write the boolean expression for this diagram
- ➤ Determine truth table for the following logic diagram