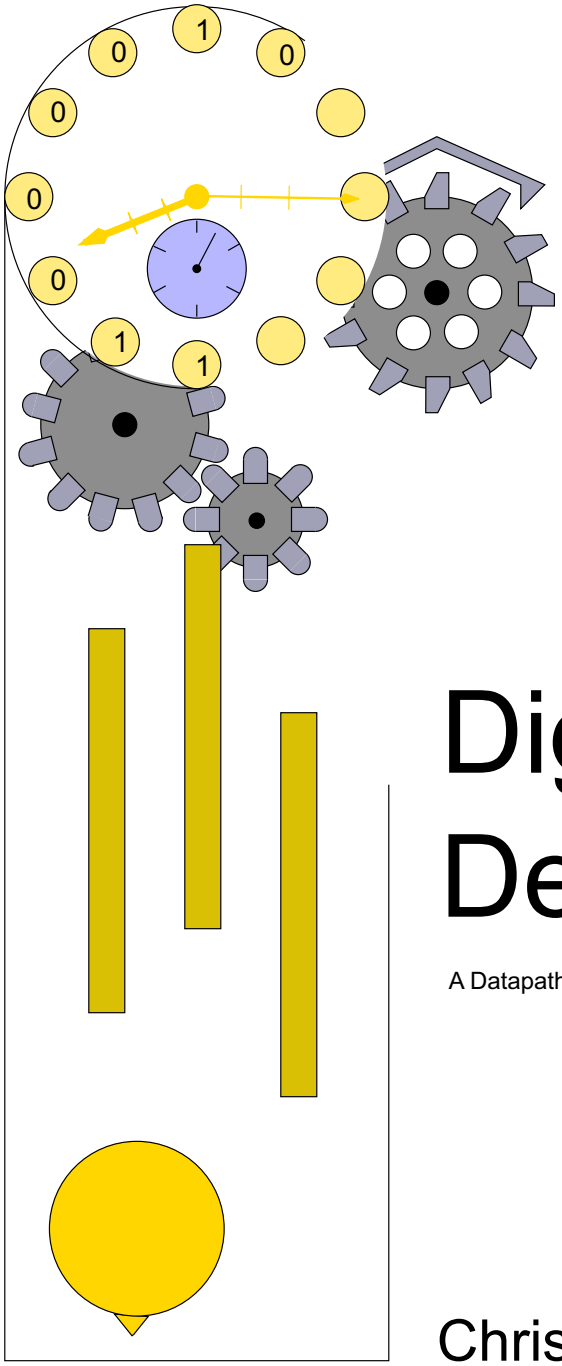

Digital Design

A Datapath and Control Approach

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September 20, 2024

Contents

Chapter 1

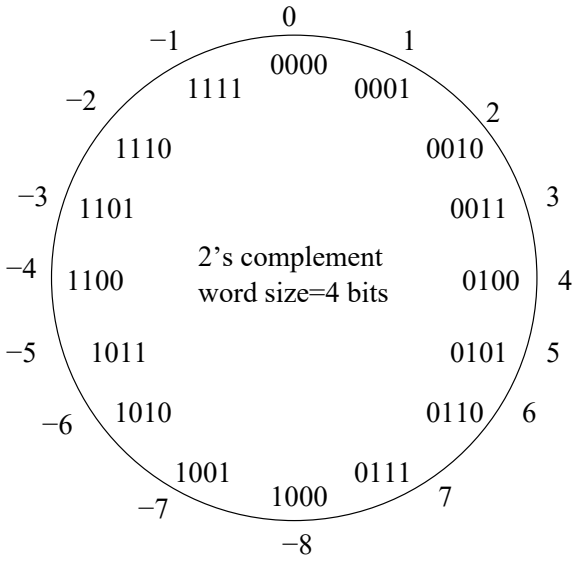
Numbering Systems

Helpfull Stuff

Decimal	Binary	Hexadecimal
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4		4
5	0101	5
6		6
7		7
8	1000	8
9		9
10	1010	A
11		B
12	1100	C
13	1101	D
14		E
15	1111	F

i	0	1	2	3	4	5	6	7	8	9
2^i	1	2	4	8	16	32	64	128	256	512

$1110101011_2 =$
$1 * 2^9 + 1 * 2^8 + 1 * 2^7 + 0 * 2^6 + 1 * 2^5 + 0 * 2^4 + 1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0 =$
$2^8(0 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0) + 2^4(1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 0 * 2^0) + 2^0 * (1 * 2^3 + 0 * 2^2 + 1 * 2^1 + 1 * 2^0) =$
$2^8(0011_2) + 2^4(1010_2) + 2^0(1011_2) =$
$2^{4*2}(0011_2) + 2^{4*1}(1010_2) + 2^{4*0}(1011_2) =$
$16^2(0011_2) + 16^1(1010_2) + 16^0 * (1011_2) =$
$16^2(3) + 16^1(A) + 16^0 * (B) =$
$3AB_{16}$



Chapter 2

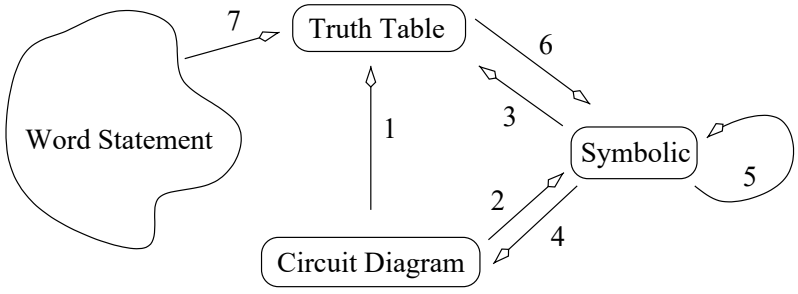
Representations of Logical Functions

2.1 Helpfull Stuff

A	B	A*B
0	0	0
0	1	0
1	0	0
1	1	1

A	B	A+B
0	0	0
0	1	1
1	0	1
1	1	1

A	A'
0	1
1	0



	Regular Algebra	Boolean Algebra
Performed First	Parenthesis	Parenthesis
	Exponents	Not
	multiplication/division	And
Performed Last	addition/subtraction	Or

Axiom	Primary	Dual
1.	x+0=x	x*1=x
2.	x+1=1	x*0=0
3.	x+x=x	x*x=x
4.	x"=x	
5.	x+x'=1	x*x'=0
6.	x+y=y+x	x*y=y*x
7.	x+(y+z)=(x+y)+z	x*(y*z)=(x*y)*z
8.	x*(y+z)=x*y+x*z	x+(y*z)=(x+y)*(x+z)
9.	(x+y)'=x'*y'	(x*y)'=x'+y'

2.2 Definitions

Define each of the following. Some of the definitions should use terms you've defined.

Minterm

Maxterm

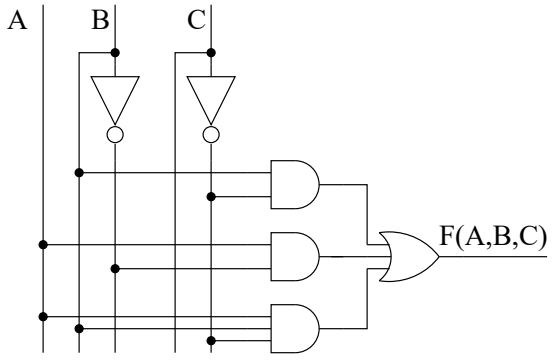
Minterm Trick

Expansion Trick

2.3 Problems

Solve the following problems in the space provided.

1. Given the circuit diagram below, produce the corresponding truth table.



A	B	C	F(A,B,C)
0	0	0	
0	0	1	
0	1	0	
0	1	1	
1	0	0	
1	0	1	
1	1	0	
1	1	1	

2. Given the symbolic expression below, produce the corresponding circuit diagram.

   F(A,B,C)=AB'+A(B'+C)

3. Given the symbolic expression below, produce the corresponding circuit diagram.

   F(A,B,C,D)=A(BC+A(C'+D)')' + B'CD'

4. Given the symbolic expression below, produce the corresponding truth table.

   F(A,B,C) = AB'+A(B'+C)

A	B	C			F(A,B,C)
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

5. Given the symbolic expression below, produce the corresponding truth table.

   F(A,B,C,D)=A(BC+A(C'+D)')' + B'CD'

A	B	C	D						F(A,B,C,D)
0	0	0	0						
0	0	0	1						
0	0	1	0						
0	0	1	1						
0	1	0	0						
0	1	0	1						
0	1	1	0						
0	1	1	1						
1	0	0	0						
1	0	0	1						
1	0	1	0						
1	0	1	1						
1	1	0	0						
1	1	0	1						
1	1	1	0						
1	1	1	1						

6. Given the truth table below, produce the corresponding symbolic expression.

A	B	C	F(A,B,C)	minterm	maxterm
0	0	0	0		
0	0	1	1		
0	1	0	1		
0	1	1	1		
1	0	0	1		
1	0	1	0		
1	1	0	0		
1	1	1	1		

7. Given the word state below, produce the corresponding truth table. Design a circuit with two 2-bit inputs called $A = a_1a_0$ and $B = b_1b_0$ The single bit output F should equal 1 when A+B > 6, otherwise F should equal 0.

a_1	a_0	b_1	b_0	A	B	$F(a_1, a_0, b_1, b_0)$
0	0	0	0			
0	0	0	1			
0	0	1	0			
0	0	1	1			
0	1	0	0			
0	1	0	1			
0	1	1	0			
0	1	1	1			
1	0	0	0			
1	0	0	1			
1	0	1	0			
1	0	1	1			
1	1	0	0			
1	1	0	1			
1	1	1	0			
1	1	1	1			