Homework 1

Friday, September 24, 2021 2:56 PM

09/28/21

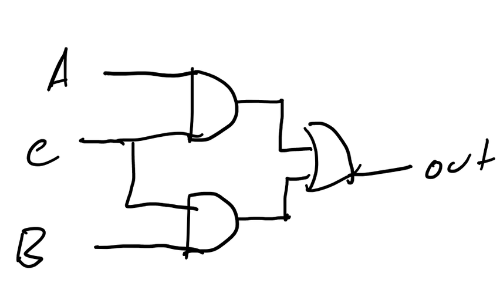
#1

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

B or $\bar{B}$ doesn't change the output, can be ignored

(B) $B \cdot C + A \cdot C$

(C)



#2

$Z = (B \cdot D) \oplus \bar{C}$

$Y = (\overline{A + B}) \cdot C$

#3

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

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
F	E	D	C	B	A	9	8	7	6	5	4	3	2	1

(A) $25_{10} \rightarrow 11001_2 \rightarrow$ flip bits

25 − 16 = 9, 9 − 8 = 1

→ 00110 Add 1

→ 00111 2's complement

$25_{10} \rightarrow 1|1001_2$ → 1 | 9 ⇒ 19

(B) $-62_{10} \rightarrow 62 \rightarrow 0\,0\,1\,1\,1\,1\,1\,0_2$

62 − 32 = 30, 30 − 16 = 14, 14 − 8 = 6, 6 − 4 = 2

→ 11000001 add 1

11000010

0011 | 1110 → 3 | 14 → 3E → −0x3E

(C) $127_{10} \rightarrow 0\,1\,1\,1\,1\,1\,1\,1$

|0111|1111| → 0+4+2+1 = 7, 8+4+2+1 = 15 → F

0x7F₁₆

#4

(A) 6AFA → 0110 1010 1111 1010

$2^{14} + 2^{13} + 2^{11} + 2^9 + 2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^1 = 27386_{10}$

(B) 0010 0001 (positive) → = 32 + 1 = 33_{10}

(C) $1011\,1001_2$ → flip + (−1) → 01000111_2 → -71_{10}

#5

(A) 63.25_{10}

63/2 = 31 + 1
31/2 = 15 + 1
15/2 = 7 + 1
7/2 = 3 + 1
3/2 = 1 + 1
1/2 = 0 + 1

→ 111111_2

.25 × 2 = .5 × 2 = 1.0 (2 places) = $.01_2$

→ 111111.01_2

63/16 → 63 = 111111_2 → 0011 | 1111 → 3 F = 3F

.25 × 16 = 4 (one place) = .4

→ $3F.4_{16}$

(B) $0 \times C13$00000 ($16^2\ 16^1\ 16^0$) → 1100 | 0001 | 0011

$(16^2 \times 12) + (16^1 \times 1) + (16^0 \times 3)$ → 3091_{10}

6

(A)
```
  00110110  → +54
+ 01000101  → +69
  01111011  → 123 ✓
```

(B)
```
  01110101  → 117
  11011110
1 01010011
↓
overflow
```
00100001 + 1 → 00100010 ⇒ 01000010 → 34

117 − 34 = 83

$01010011_2 = +83$

(C)
```
  10011101 →
  10000001 →
1 00011110
```
00011110_2 → 30

01100010 → 01100011 = 01100011 = 101

01111110 + 1 → 01111111 = 01111111 = 127

−101 − 127 = −228

(D)
```
  00101101
× 00000101
  00101101
 000000000
00101101 00
0011100001₂
```

#7

(A) $x'y'z' + x'y'z + x'yz + xy'z' + xy'z$

x \ yz	00	01	10	11
0	1	1	0	1
1	1	1	0	0

$x'yz + y'z' + y'z$

(B) $x'y'z + x'yz + xyz$

x \ yz	00	01	10	11
0		1		1
1				1

$yz + x'y'z$

(C) $A'B'C'D' + AC'D' + B'CD' + A'BCD + BC'D$

AB \ CD	00	01	10	11
00	1	0	1	0
01	0	0	0	1
10	1	1	1	0
11	1	1	0	0

$AC' + A'B'C'D' + A'B'CD' + A'BCD + AB'CD'$

$A(C' + B'CD') + A'(B'C'D' + B'CD' + BCD)$

(D) $x'z + w'xy' + w(x'y + xy')$

wx \ yz	00	01	10	11
00	0	1	0	1
01	1	1	0	0
10	0	1	1	1
11	1	1	0	0

$y'z + wx'y + wxy' + w'x'yz$