EE 115B, Fall 2024, Homework 1

Solution

1. (1)

$2 \mid 25$ → 1
$2 \mid 12$ → 0
$2 \mid 6$ → 0
$2 \mid 3$ → 1
$2 \mid 1$ → 1
0

$(25)_{10} = (11001)_2$

$0.75 \times 2 = 1.5$ → 1
$0.5 \times 2 = 1.0$ → 1

$(0.75)_{10} = (0.11)_2$

$(25.75)_{10} = (11001.11)_2$

(2) $(10010.01)_2 = 1 \times 2^4 + 1 \times 2^1 + 1 \times 2^{-2}$

$= (18.25)_{10}$

(3) $3\ D.4$

$0011\ 1101 . 0100$

$(3D.4)_{16} = (11101.01)_2$

(4) 100.11

$001\ 100 . 110$

$1\ 4 . 6$

$(100.11)_2 = (14.6)_8$

(5) $5\ 2.3$

$101\ 010 . 011$

$0010\ 1010 . 0110$

$2\ A . 6$

$(52.3)_8 = (2A.6)_{16}$

(6) 3 9

0011 1001

$(39)_{10} = (00111001)_{BCD}$

2. (1) 2 1's → even parity bit is '0'.

(2) 4 1's → even parity bit is '0'.

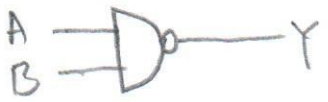
3. $\overline{A \odot B} = \overline{AB + \bar{A}\bar{B}} = \overline{AB} \cdot \overline{\bar{A}\bar{B}}$

$= (\bar{A} + \bar{B})(A + B) = \underbrace{\bar{A}A}_{0} + \bar{A}B + \bar{B}A + \underbrace{\bar{B}B}_{0}$

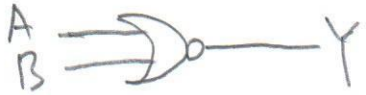
$= \bar{A}B + A\bar{B}$

$= A \oplus B$

4. ① NAND $(\overline{AB} = \bar{A} + \bar{B})$



② NOR $(\overline{A+B} = \bar{A}\bar{B})$



5. ① $Y(A,B,C) = (B + \bar{C})(\bar{A} + B)$

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

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

↘ redundant

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

explicit pos

$= M_1 \cdot M_5 \cdot M_4$

compact pos $= \Pi M(1, 4, 5)$

compact sop $= \Sigma m(0, 2, 3, 6, 7)$

$= m_0 + m_2 + m_3 + m_6 + m_7$

explicit sop $= \bar{A}\bar{B}\bar{C} + \bar{A}B\bar{C} + \bar{A}BC + AB\bar{C} + ABC$

② truth table

A	B	C	Y
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1