~~M/y/A~~

Autumn : 2016

Answer to the Question No:1 (a)

Now the addition of two ~~aut~~ numbers using BCD code is

8421
0110 = 6
0100 = 4
0101 = 5

46 = 0100 0110

55 = 0101 0101

= 1001 1011

∴ if invalid add 6 = 0110

1010 0001

∴ if invalid add 6 = 0110

1 0000 0001

∴ More precisely = 0001 0000 0001

1 0 1

So the BCD addition of ~~45~~ 46+55 is = 101

Answer to the Question No: 1(b)

Binary codes are those codes which depend on the binary number system to represent its meaning. Binary codes are two base codes. They are '0' and '1'

Advantages of Excess 3 codes over BCD codes are:-

① Excess 3 code has no limitation

② It considerably simplifies arithm-etic operations.

Answer to the Question NO:1(c)

A gray code is an encoding of numbers so that adjacent numbers have a ~~Sime~~ single ~~bit~~ digit differing by 1.

Three gray codes for 3 variables

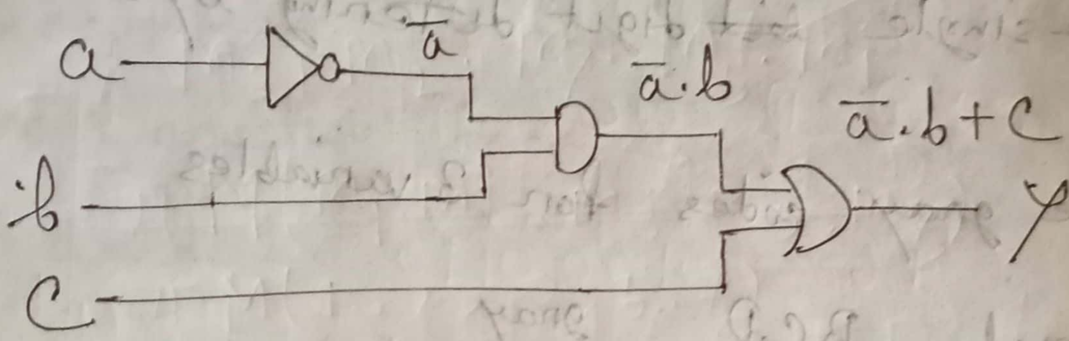
Decimal		BCD		gray
1	=	0001	=	0001
5	=	0101	=	0111
6	=	0110	=	0101

process had been provided in the previous number system Pdf.

~~process in has been~~

Answer to the Question 2(a)

So the given circuit



So the boolean expression is

$$y = \bar{a}.b + c$$

Truth Table:-

	a	b	c	$\bar{a}$	~~$\bar{a}.b$~~	$\bar{a}b$	$\bar{a}b+c$
1	0	0	0	1	0	0	0
2	0	0	1	1		0	1
3	0	1	0	1	0	1	1
4	0	1	1	1		1	1
5	1	0	0	0	0	0	0
6	1	0	1	0		0	1
7	1	1	0	0	0	0	0
8	1	1	1	0		0	1

Answer to the Ques NO: 2(b)

So the above expression is

$y = \bar{a}b + c$

$= \bar{a}b(c+\bar{c}) + c(a+\bar{a})(b+\bar{b})$

$= \bar{a}bc + \bar{a}b\bar{c} + abc + a\bar{b}c + \bar{a}bc + \bar{a}\bar{b}c$

$\therefore Y_1 = \bar{a}bc + \bar{a}b\bar{c} + abc + a\bar{b}c + \bar{a}\bar{b}c$

$= m_3 + \cancel{m_3}\, m_2 + m_7 + m_5 + m_1$

$= m_1 + m_2 + m_3 + m_5 + m_7$

$\therefore$ Sum of minterms,

$= \sum m(1, 2, 3, 5, 7)$

$\therefore$ we can express POS or Product of Max-term,

$\overline{Y_1} = \overline{\bar{a}bc + \bar{a}b\bar{c} + abc + a\bar{b}c + \bar{a}\bar{b}c}$

$= (\overline{\bar{a}bc}) \cdot (\overline{\bar{a}b\bar{c}}) \cdot (\overline{abc}) \cdot (\overline{a\bar{b}c})(\overline{\bar{a}\bar{b}c})$

(b)

$$= (a+\bar{b}+\bar{c})\cdot(a+\bar{b}+c)\cdot(\bar{a}+\bar{b}+\bar{c})(\bar{a}+b+\bar{c})$$
$$(a+b+\bar{c})$$

$$= M_3 \cdot M_2 \cdot M_7 \cdot M_5 \cdot M_1$$

$$\cancel{= \pi M(m_1, m_2, m_3, m_5, m_7)}$$
$$= \pi M(1, 2, 3, 5, 7)$$

∴ It's the Product of Maxterms

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Answer to the Question No: 2(c)

$$F1 = (A+C)(AD+AD)+A'C+C$$
$$= (A+C)(AD)+C(A+1)$$
$$= AAD+ADC+C$$
$$= AD+ADC+C$$
$$= AD+C(AD+1)$$
$$= AD+C$$

Ans

$$F2 = (A'.(A+B)')'+(B+AA)(A+B)$$
$$= (A'(A'+B'))'+(A+B)(A+B)$$
$$= (A'B')'+(A+B)$$
$$= (A''+B'')+(A+B)$$
$$= (A+B)+(A+B)$$
$$= A+B$$

Ans

Answer to the Question No: 3(a)

$$F = (A' + B' + D)\cdot(A' + D')(A + B + D')(A + B' + C + D)$$

$$= (A''\cdot B''\cdot D') + (A''\cdot D'') + (A'\cdot B'\cdot D'') + (A'\cdot B''\cdot C'\cdot D')$$

$$= (ABD') + (AD) + (A'B'D) + (A'BC'D')$$

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	0_{0}	1_{1}	1_{3}	0_{2}
$\bar{A}B$	1_{4}	0_{5}	0_{7}	0_{6}
AB	1_{12}	1_{13}	1_{15}	1_{14}
$A\bar{B}$	0_{8}	1_{9}	1_{11}	0_{10}

$\therefore F = AD + AB + B\bar{C}\bar{D} + \bar{B}D$

Ans:

Anser to the Qestion No. 3 (b)

$F = AB'C + B'C'D' + BCD + ACD'$
$+ A'B'C + A'BC'D$

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1_{0}	0_{1}	1_{3}	1_{2}
$\bar{A}B$	0_{4}	1_{5}	1_{7}	0_{6}
AB	0_{12}	0_{13}	1_{15}	1_{14}
$A\bar{B}$	1_{8}	0_{9}	1_{11}	1_{10}

$F = \bar{A}BD + \bar{B}\bar{D} + AC + CD$

Ans

Answer to the Question NO: 3(c)

$$F(A,B,C,D) = \Sigma(0,4,5,8,10,15)$$

$$d(A,B,C,D) = \Sigma(2,7,9,13)$$

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1 (0)	(1)	(3)	X (2)
$\bar{A}B$	1 (4)	1 (5)	X (7)	(6)
AB	0 (12)	X (13)	1 (15)	(14)
$A\bar{B}$	1 (8)	X (9)	0 (11)	1 (10)

$$F = \bar{B}\bar{D} + BD + \bar{A}\bar{C}\bar{D}$$

Ans:

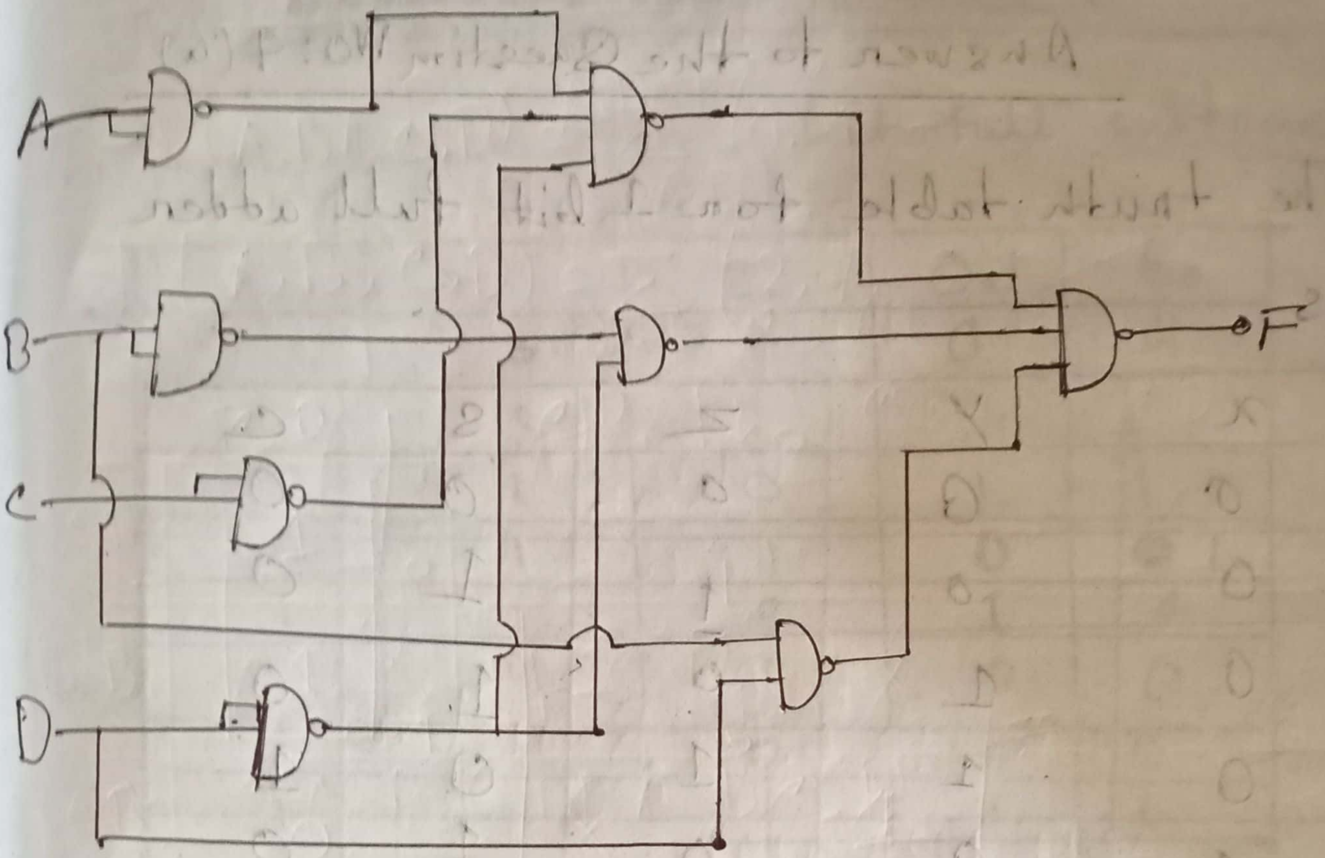
Implementing F equation using NAND Gate

The given equation

$$F = \bar{B}\bar{D} + BD + \bar{A}\bar{C}\bar{D}$$

$$= \overline{\overline{\bar{B}\bar{D} + BD + \bar{A}\bar{C}\bar{D}}}$$

$$= \overline{\overline{\bar{B}\bar{D}} \cdot \overline{BD} \cdot \overline{\bar{A}\bar{C}\bar{D}}}$$



$$F = \overline{\overline{\bar{B}\,\bar{D}} \cdot \overline{B\,D} \cdot \overline{\bar{A}\,\bar{C}\,\bar{D}}}$$

Ans

Answer to the Question No: 4(a)

The truth table for 1 bit full adder is,

x	y	z	S	C
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Answer to the Question NO: 4(b)

The truth table for 1 bit full subtractor

x	Y	Z	Out	Bo
0	0	0	0	0
0	0	1	1	1
0	1	0	1	1
0	1	1	0	1
1	0	0	1	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

XOR Gate. 4 C

Many seemed to be confused with this. The confusion is where to start from. Let us consider a practical case where you are actually walking up and down the stairs and real situations were you need to turn on and off the light in a sequential manner.

Let S1, S2 represent the status of switches on first floor and second floor respectively. Let Y be the status of bulb. 1 represents on condition and 0 represents off condition.

You are climbing up from first floor to second floor.

Both switches are off and the light is also off, now its S1=0, S2=0 and Y=0.

You need light to walk up the staircase. So you switch on S1 on the first floor, the light should get switched on. Hence now S1=1, S2=0 and Y=1.

After climbing the stairs, you reached S2 and now you want to switch off the light as you no longer need it as you have crossed the stairs, so you press switch S2 (you actually turn S2 on to switch off the light). Now, S1=1, S2=1, Y=0

Similarly if you start the other way round - i.e. you are moving down from second floor to first floor, you will observe that when S1=0, S2=1, Y=1

From the above observations, we can conclude that the output is on whenever either of the switches are on and off when both the switches are together on and off. The only truth table that matches with this is that of the XOR gate.