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Subject: DLD

program: BEE

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Q.1 (a)

(i) $(1101101)_2$

Sol:

$(1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) +$

$(0 \times 2^1) + (1 \times 2^0)$

$= 64 + 32 + 0 + 8 + 4 + 0 + 1$

$\boxed{= (109)_{10}}$

(ii) 0.1011

Sol:-

$(1 \times 2^{-1}) + (0 \times 2^{-2}) + (1 \times 2^{-3}) + (1 \times 2^{-4})$

$= 0.5 + 0 + 0.125 + 0.0625$

$\boxed{= (0.6875)_{10}}$

Q# 1

(b)

(i) $(0.3125)_{10}$

Sol

$0.3125 \times 2 = 0.625$ carry 0

$0.625 \times 2 = 1.25$ carry 1

$0.25 \times 2 = 0.5$ carry 0

$0.5 \times 2 = 1$ carry 1

$(0.0101)_2$

(ii) $(58)_{10}$

Sol

2	58	
2	29	0
2	14	1
2	7	0
2	8	1
	1	1

$(11010)_2$

Q. 1 (c) Using r's complement subtract (3)

(i) 1000100 − 1010100

Sol

1010100

2^7 − 1010100

10000000 − 1010100

2	128	
2	64	0
2	32	0
2	16	0
2	8	0
2	4	0
2	2	0
	1	0

$$\begin{array}{r} 10000000 \\ 1010100 \\ \hline 01010100 \end{array}$$

$$\begin{array}{r} 0101100 \\ +\ 1000100 \\ \hline 1110000 \end{array}$$

$\boxed{1110000}$ Answer

3

(ii) 1010100 − 1000100

Sol

1000100

$2^7 - 1000100$

128 − 1000100

10000000 − 1000100

$$\begin{array}{r} 10000000 \\ 1000100 \\ \hline 0111100 \end{array}$$

$$\begin{array}{r} 0111100 \\ 1010100 \\ \hline \end{array}$$

2	128	
	64	0
	32	0
	16	0
	8	0
	4	0
	2	0
	1	0

$\boxed{00010000}$ Ans

Q(1)

(d)

(i) Add BCD Numbers 1001 + 0100

Sol :-

first add the 1001 & 0100

$$
\begin{array}{r}
1001 \\
+\ 0100 \\
\hline
1101
\end{array}
$$

we get

1101

but it is not BCD form. so, we add 0110 with 1101 where, 0110 = 6

$$
\begin{array}{r}
1101 \\
+\ 0110 \\
\hline
10011
\end{array}
$$

we get

10011

& its BCD form is 00010011

(ii) Convert the binery code 10110 to gray code

10110

Sol.

$(10110)_2$ Binery

1 0 1 1 0

(1 1 1 0 1) gray code

Q#2

(a) $F(A.B.C.D) = \Sigma\,(0,1,2,5,8,9,10)$

T. Table

Decimal	A	B	C	D	F
0	0	0	0	0	1
1	0	0	0	1	1
2	0	0	1	0	1
3	0	0	1	1	0
4	0	1	0	0	0
5	0	1	0	1	1
6	0	1	1	0	0
7	0	1	1	1	0
8	1	0	0	0	1
9	1	0	0	1	1
10	1	0	1	0	1
11	1	0	1	1	0
12	1	1	0	0	0
13	1	1	0	1	0
14	1	1	1	0	0
15	1	1	1	1	0

For SOP $F=1$, $\bar{F}=0$ $\left\{ \begin{array}{l} 0 \rightarrow \bar{A} \\ 1 \rightarrow A \end{array} \right\}$

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

$A.\bar{B}.\bar{C}.\bar{D} + A.\bar{B}.\bar{C}.D + A.\bar{B}C.\bar{D}$

Applying Boolean Rules

$\bar{A}.\bar{B}.\bar{C}.(\bar{D}+D + \bar{B}.C.\bar{D}(\bar{A}+A) + A.\bar{B}.\bar{C}(\bar{D}+D) + \bar{A}.B.\bar{C}.D$

$= \bar{A}.\bar{B}.\bar{C} + \bar{B}.C.\bar{D} + A.\bar{B}.\bar{C} + \bar{A}.B.\bar{C}.D$

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

$\boxed{= \bar{B}.\bar{C} + \bar{B}.C.\bar{D} + \bar{A}.B.\bar{C}.D}$

POS: $F = 0$ & $\left\{ \begin{array}{l} 0 \to A \\ 0 \to \bar{A} \end{array} \right\}$

$F = 0$

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

Q.2

(b) Prove that $A+A'B = A+B$. ALSO show the proof on the truth table & draw the logic circuit

$A + A'B = A + B$

$A + \bar{A}B = (A+AB) + \bar{A}B$ Rule 10: $A = A + AB$

$= (AA + AB) + \bar{A}B$ Rule 7: $A = AA$

$= AA + AB + A\bar{A} + \bar{A}B$ Rule 8: adding $A\bar{A} = 0$

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

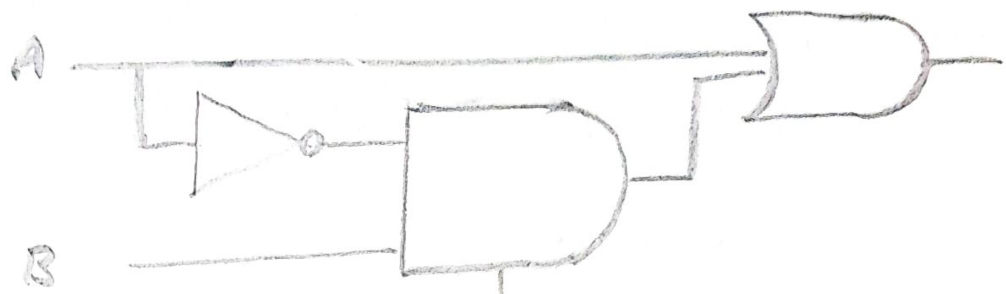
$= 1.\ (A+B)$ Rule 6: $A + \bar{A} = 1$

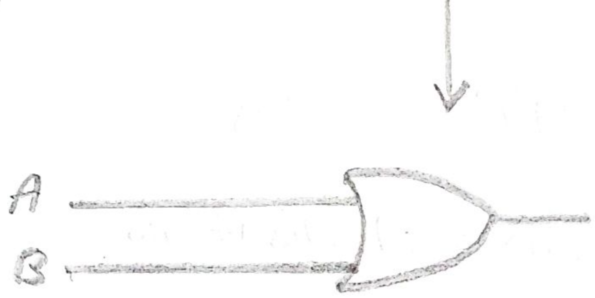
$= A+B$ Rule 4: drop the 1

Proof show on truth table:

A	B	$\bar{A}B$	$A+\bar{A}B$	$A+B$
0	0	0	0	0
0	1	1	1	1
1	0	0	1	1
1	1	0	1	1

Logic circuit:-





Q#2

(C) Apply De Morgan's theorems to simplify the following expression

$$\overline{\overline{A+B\overline{C}} + D(\overline{E+\overline{F}})}$$

Sol:-

Applying Demorgen's theorms

$$\overline{\overline{(A+B\overline{C})}}.\overline{D} + (\overline{\overline{E}} + \overline{\overline{\overline{F}}})$$

$$\Rightarrow (\overline{\overline{A}} + \overline{\overline{B}}.\overline{\overline{\overline{C}}}).\overline{D} + E + \overline{F}$$

$$\Rightarrow (A+B\overline{C})(\overline{D}+E+\overline{F})$$

Q.3

(a)

0	0	1	1
0	0	1	0
0	1	1	0
1	1	1	1

0	0	0	1
1	1	0	1
1	1	1	1
1	0	1	1

(11)

Q#3

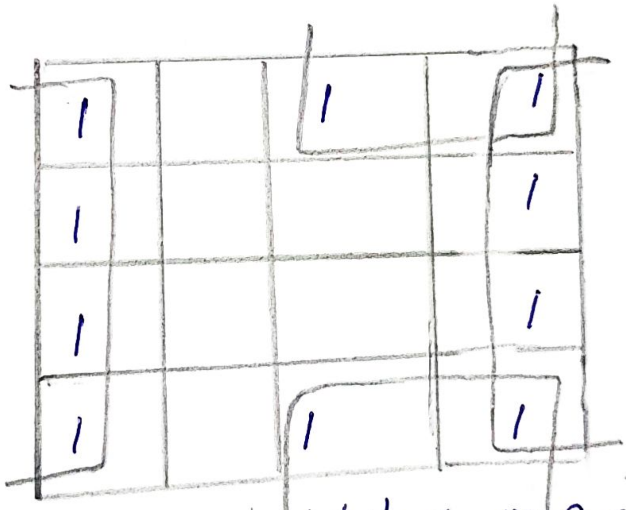
(b) Use a karnaugh map to simplify the following Sop expression

$B'C'D' + A'BC'D' + ABC'D' + A'B'CD + AB'CD +$

$A'B'CD' + A'BCD' + ABCD' + AB'CD'$

Sol :-

The first term $\bar{B}\bar{C}\bar{D}$ must be expended into $A\bar{B}\bar{C}\bar{D}$ & $\bar{A}\bar{B}\bar{C}\bar{D}$ to get the standerd SOP expression. which is than mapped & the cell are grouped as shown in



Notice that both groups exhibit "wrap arround" adjancency. The group of eight is formed because the cells in outer coloumn are adjecent. The group of four is formed to pick up the remaing two 1s become the top & bottom cell are adjecent. The product term for each group is shown & resulting minimum SOP expression is $\boxed{\bar{D} + BC}$ Answer

Q.3

(b) Use a Karnaugh map to simplify the following SOP expression

$B'C'D' + A'BC'D' + ABC'D' + A'B'CD + AB'CD +$
$A'B'CD' + A'BCD' + ABCD' + AB'CD$

A B CD

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

$(A'C'D' + BCD + AB'D')$.

Answer