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Answer to the Question No: 1

(a)

| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
|-----|----|----|----|---|---|---|---|

~~129~~

129 + 74

129 $\longrightarrow$  1 0 0 0 0 0 0 1

74 $\longrightarrow$  0 1 0 0 1 0 1 0

203 $\longrightarrow$  1 1 0 0 1 0 1 1

$(11001011)_2 = (203)_{10}$

So, the value are same in both side.

## ⓑ

$$(159)_{10} = (10011111)_2$$

$$(10011111)_2 \xrightarrow{\text{2's complement}} (01100001)_2$$

## ⓒ

$(-138) - (-154) = (-138) + (154)$

$$(138)_{10} = (010001010)_2 \xrightarrow{\text{2's}} \cancel{(01110110)} \; (101110110)_2 = (-138)_{10}$$

$$
\begin{array}{r}
\overset{111\cancel{1}}{} \\
-138 \rightarrow 10\cancel{1111}0110 \\
154 \rightarrow 0\cancel{10011}1010 \\
\hline
1100\,0\,0
\end{array}
$$

$$
\begin{array}{r}
\overset{1\,1\,1\,1\,1\,1\,1}{} \\
-138 \rightarrow 1011110110 \\
154 \rightarrow 0100110010 \\
\hline
-16 \rightarrow \cancel{1}0\,0001\,0000 \quad (\text{Underflow}) \\
\text{Discard}
\end{array}
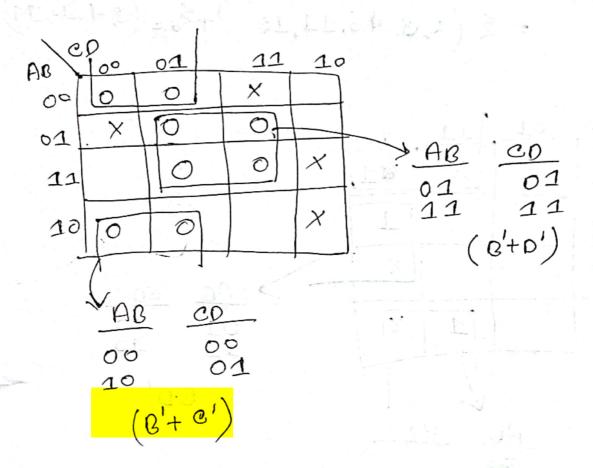$$

$$(10000010000)_2 = \cancel{(-8)_{10}} \; (16)_{10}$$

## (d)

$(-87) = (01010111)_2 \xrightarrow{2's} (10101001)_2 = (-87)_{10}$

$(93) = (01011101)_2 \xrightarrow{2's} (10100011)_2 = (-93)_{10}$

$-87 \longrightarrow 10101001$

$-93 \longrightarrow 10100011$

$-87 \longrightarrow 10101001$

$-93 \longrightarrow 10100011$

$-180 \longrightarrow 1010011100$ (Underflow)

Discard

$(01001100)_2 = (76)_{10}$

Amswer to the Question No: 4

$$F(A,B,C,D) = \Sigma(2,6,11,12) + \Sigma_{d.c}(3,4,10,14)$$

$$= \pi(0,1,5,7,8,9,13,15) \cdot \pi_{d.c}(3,4,10,14)$$



K-map (AB rows: 00, 01, 11, 10; CD columns: 00, 01, 11, 10):

| AB \ CD | 00 | 01 | 11 | 10 |
|---------|----|----|----|----|
| 00 | 0 | 0 | × | |
| 01 | × | 0 | 0 | |
| 11 | | 0 | 0 | × |
| 10 | 0 | 0 | | × |

| AB | CD |
|----|----|
| 01 | 01 |
| 11 | 11 |

$(B' + D')$

| AB | CD |
|----|----|
| 00 | 00 |
| 10 | 01 |

$(B' + C')$

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

Answer to the Question No. 5

$$F(A,B,C,D) = \pi(0,1,5,7,8,9,13,15) \cdot \pi_{d.c}(2,4,10,11)$$

$$= \sum(2,3,4,6,11,12) + \sum_{d.c}(3,4,10,11)$$



| AB\CD | 00 | 01 | 11 | 10 |
|---|---|---|---|---|
| 00 | | | X | X 1 |
| 01 | X | | | 1 |
| 11 | 1 | | | X |
| 10 | | | 1 | X |

AB   CD
01   00
11   10

$B \cdot D'$

AB   CD

00   11
10   10

$B'C$

$$F = BD' + B'C$$

Answer to the question No: 3

GSOP

$$F(A,B,C,D) = (B'C + A)(A' + B + D')\ \textcolor{gray}{o\!d}\ C'$$

$$= (B'C + A)(A'C' + BC' + C'D')$$

$$= (B'C + A)A'C' + (B'C + A)BC' +$$
$$(B'C + A)C'D'$$

$$= A'B'CC' + AA'C' + B'BCC' + ABC' +$$
$$\cancel{B'BCC'}\ B'CC'D' + AC'D'\quad [X \cdot X' = 0]$$

$$= ABC' + AC'D'$$

$$= ABC'(D + D') + A(B + B')C'D'$$

$$= (ABC'D) + (ABC'D') + (ABC'D') +$$
$$(AB'C'D')$$

$$= (ABC'D) + (AB'C'D') + (ABC'D')$$

$$F(A,B,C,D) = (B'+D)(AB'+C')D' + BD'(A'+D') + C'$$

$B'+D$
```
: 1 _ 0
0 1 0 0
0 1 1 0
1 1 0 0
1 1 1 0
```

$AB' + C$
```
1 0 _ _
1 0 0 0
1 0 0 1
1 0 1 0
1 0 1 1
```

$C'$
```
_ _ 0 _
0 0 0 0
0 0 0 1
0 0 1 0 0
0 1 0 1
1 0 0 0
1 0 0 1
1 1 0 0
1 1 0 1
```

$D'$
```
_ _ _ 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 0
```

$BD'$
```
_ 1 _ 0
0 1 0 0
0 1 1 0
1 1 0 0
1 1 1 0
```

$A'+D'$
```
1 _ _ 1
1 0 0 1
1 0 1 1
1 1 0 1
1 1 1 1
```

$C'$
```
_ _ 1 _
0 0 1 0
0 0 1 1
0 1 1 0
0 1 1 1
1 0 1 0
1 0 1 1
1 1 1 0
1 1 1 1
```

| ABCD | $(B'+D)(AB'+C')D'$ | $BD'(A'+D')$ | $C'$ | F |
|---|---|---|---|---|
| 0000 | 0 | 1 | 1 | 1 |
| 0001 | 0 | 1 | 1 | 1 |
| 0010 | 1 | 1 | 0 | 1 |
| 0011 | 1 | 1 | 0 | 1 |
| 0100 | 0 | 0 | 1 | 1 |
| 0101 | 0 | 1 | 1 | 1 |
| 0110 | 0 | 0 | 0 | 0 |
| 0111 | 1 | 1 | 0 | 1 |
| 1000 | 0 | 1 | 1 | 1 |
| 1001 | 0 | 0 | 1 | 1 |
| 1010 | 0 | 1 | 0 | 1 |
| 1011 | 0 | 0 | 0 | 0 |
| 1100 | 0 | 0 | 1 | 1 |
| 1101 | 1 | 0 | 1 | 1 |
| 1110 | 0 | 0 | 0 | 0 |
| 1111 | 1 | 0 | 0 | 1 |