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Section: A

Depart: BS, SE, 3

Subject: DLD

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Q.1 Convert each of the Foll Number to the required number System

A) $(1011100.10101)_2 = (\ldots\ldots)_{10}$

Ans:

$2^6\ 2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0\ .\ 2^{-1}\ 2^{-2}\ 2^{-3}\ 2^{-4}\ 2^{-5}$

$1\ 0\ 1\ 1\ 1\ 0\ 0\ .\ 1\ 0\ 1\ 0\ 1$

$64+16+8+4+0+0.\ 0.5+0+0.125+0+0.03125$

92.065625

$(92.065625)_{10}$

B) $(111100.101)_2 = (\ldots\ldots)_{10}$

Ans:

$2^5\ 2^4\ 2^3\ 2^2\ 2^1\ 2^0\ .\ 2^{-1}\ 2^{-2}\ 2^{-3}$

$1\ 1\ 1\ 1\ 0\ 0\ .\ 1\ 0\ 1$

$32+16+8+4+0+0.\ 0.5+0+0.125$

$60\ .\ 0.625$

$(60.625)_{10}$

C) $(ABCD)_{16} = (\ldots\ldots)_2$

Ans:

$(ABCD)_{16}$

A B C D

1010, 1011, 1100, 1101

$(1010101111001101)_2$

D) $(10)_{10} = (....)_{16}$

Ans: $(10)_{10} = (?)_{16}$

$\frac{10}{16} = 0.625 \times 16 = 10 = A$

= $(A)_{16}$

E) $(7777)_8 = (....)_{10}$

Ans: $8^3 \quad 8^2 \quad 8^1 \quad 8^0$

7 7 7 7

↓ ↓ ↓ ↓

$7 \times 512 + 7 \times 64 + 7 \times 8 + 7 \times 1$

$3584 + 448 + 56 + 7$

$(4095)_{10}$

F) $(7777)_8 = (....)_2$

111, 111, 111, 111,

$(\underbrace{111}_{7}\,\underbrace{111}_{7}\,\underbrace{111}_{7}\,\underbrace{111}_{7})_2$

$(111111111111)_2$

0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

G) $(7777)_8 = (\ldots)_{16}$

Octal to Hexadecimal

First convert Octal to Binary

$(7777)_8 = (\ldots)_2$

$\underbrace{111}_{7}$ $\underbrace{111}_{7}$ $\underbrace{111}_{7}$ $\underbrace{111}_{7}$

$(111111111111)_2$

Now convert Binary to Hexadecimal

$\underbrace{1111}_{F}$ $\underbrace{1111}_{F}$ $\underbrace{1111}_{F}$

$(FFF)_{16}$ Ans.

H) $(10101111)_2 = (\ldots)_8$

Binary to Octal

$\cancel{\underbrace{1010}_{A}}$ $\cancel{\underbrace{1111}_{F}}$

H) $(1010\ 1111)_2 = (?)_8$

$(10101111)_2 = (\ldots)_8$

First we convert into Decimal

$$\begin{array}{cccccccc} 2^7 & 2^6 & 2^5 & 2^4 & 2^3 & 2^2 & 2^1 & 2^0 \\ 1 & 0 & 1 & 0 & 1 & 1 & 1 & 1 \end{array}$$

$128 + 0 + 32 + 0 + 8 + 4 + 2 + 1$

$(175)_{10}$

Now Decimal to Octal

$(175)_{10} = (?)_8$

$8 \,|\, 175$

17

$\frac{175}{8} = 21.875 \times 8 = 7$

$\frac{21}{8} = 2.625 \times 8 = 5$

$\frac{2}{8} = 0.25 \times 8 = 2$

$(257)_8$

I) $(1010 10)_{10} = (\ldots)_8$

$\frac{101010}{8} = 12626.25$

$\frac{12626}{8} = 1578.\underline{25 \times 8} = 2$

$\frac{1578}{8} = 197.\underline{25 \times 8} = 2$

$\frac{197}{8} = 24.\underline{625 \times 8} = 5$

$\frac{24}{8} = 3.\underline{0 \times 8} = 0$

$\frac{3}{8} = \underline{0.375 \times 8} = 3$

$(30522)_8$

J) $(98)_{10} = (\ldots)_{BCD}$

0	0 0 0 0
1	0 0 0 1
2	0 0 1 0
3	0 0 1 1
4	0 1 0 0
5	0 1 0 1
6	0 1 1 0
7	0 1 1 1
8	1 0 0 0
9	1 0 0 1
10	1 0 1 0
11	1 0 1 1
12	1 1 0 0
13	1 1 0 1
14	1 1 1 0
15	1 1 1 1

$(98)_{10} = (\ldots)_{BCD}$

9   8

1001,   1000

$(10011000)_{BCD}$

Q.2 Apply De-Morgan's theorem's to each expression.

A)

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

Solution:

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

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

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

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

B)

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

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

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

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

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

Ans.

Q.2 Apply De-Morgan's theorem's to each expression.

A)

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

Solution:

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

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

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

$$\overline{A}+B+(\overline{C}+D) \quad \text{Ans.}$$

B)

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

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

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

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

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

Ans.

Q.3 Develop a truth table for each of the following standard SOP expression:

We know That:
variable → A, B, x, y
complement = $\bar{A}$, $\bar{B}$, $\bar{x}$, $\bar{y}$

variable A = 0 complement = $\bar{A}$ = 1

A) $\bar{X}\bar{Y}\bar{Z} + \bar{X}Y\bar{Z} + X\bar{Y}Z + \bar{X}YZ + XY\bar{Z}$

X	Y	Z	Man term.
1	1	1	$\bar{X}\bar{Y}\bar{Z}$
1	0	1	$\bar{X}Y\bar{Z}$
0	1	0	$X\bar{Y}Z$
1	0	0	$\bar{X}YZ$
0	0	1	$XY\bar{Z}$

X	Y	Z	
0	0	0	$\bar{x}\bar{y}\bar{z} = 1$
0	0	1	0
0	1	0	$\bar{X}Y\bar{Z} = 1$
0	1	1	$\bar{X}YZ = 1$
1	0	0	0
1	0	1	$X\bar{Y}Z = 1$
1	1	0	$XY\bar{Z} = 1$
1	1	1	0

Q.3 B) $\bar{A}\bar{B}C\bar{D} + AB\bar{C}\bar{D} + \bar{A}\bar{B}CD + \bar{A}\bar{B}\bar{C}\bar{D}$

A	B	C	D	
1	1	0	1	$\bar{A}BC\bar{D}$
0	0	1	1	$AB\bar{C}\bar{D}$
1	1	0	0	$\bar{A}\bar{B}CD$
1	1	1	1	$\bar{A}\bar{B}\bar{C}\bar{D}$
				~~B~~

✓

A	B	C	D		
0	0	0	0	→	$\bar{A}\bar{B}\bar{C}\bar{D} = 1$
0	0	0	1	0	
0	0	1	0	→	$\bar{A}\bar{B}C\bar{D} = 1$
0	0	1	1	→	$\bar{A}\bar{B}CD = 1$
0	1	0	0	0	
0	1	0	1	0	
0	1	1	0	0	
0	1	1	1	0	
1	0	0	0	0	
1	0	0	1	0	
1	0	1	0	0	
1	0	1	1	0	
1	1	0	0	←	$AB\bar{C}\bar{D} = 1$
1	1	0	1	0	
1	1	1	0	0	
1	1	1	1	0	

Q4. Convert the following expressions to sum-of-product (SOP) form.

A) $BC + DE(B\bar{C} + DE)$

Ans:

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

$(BD + BE . CD + CE) + (B+\bar{C})$

$D+E)$

B) $BC(\bar{C}\bar{D} + CE)$

Solution:

$BC(\bar{C}\bar{D} + CE)$

$\cancel{(BC+\bar{C}\bar{D})(BC+CE)}$

$\cancel{BC}$

$BC\cancel{(CD)}$

$BC(\bar{C}\bar{D} + CE)$

$(BC+\bar{C}\bar{D}).(BC+\cancel{B}CE)$

$C\cancel{D}$

$(BC + BC + \bar{C}\bar{D} + BC + \cancel{B}CD + CE)$

$BC + \bar{C}\bar{D} + BC + CD + CE$

$$BC + \bar{C}\bar{D} + BC + CE$$

$$BC + \overline{C}\overline{D} + CE$$

$$CD + C\bar{E}$$

$$(C\bar{E} + CD)$$

$$C)\ B + C[BD + ((C + \bar{D})E)]$$

$$B + C[BD.(C + \bar{D})E]$$

$$B + C[BDC + BD\bar{D}) + E]$$

$$B + C\{BDC + BDD)E)$$

$$(B + C) + (BDC)E)$$

$$(B + C) + (EBCE)$$

$$(B + C) + (EBCE)$$

$$B + C + EBC$$

$$BC + EBC$$

$$(E)$$