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Subject : DLD

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Mid Term Paper

Course : S/E

9th Semester

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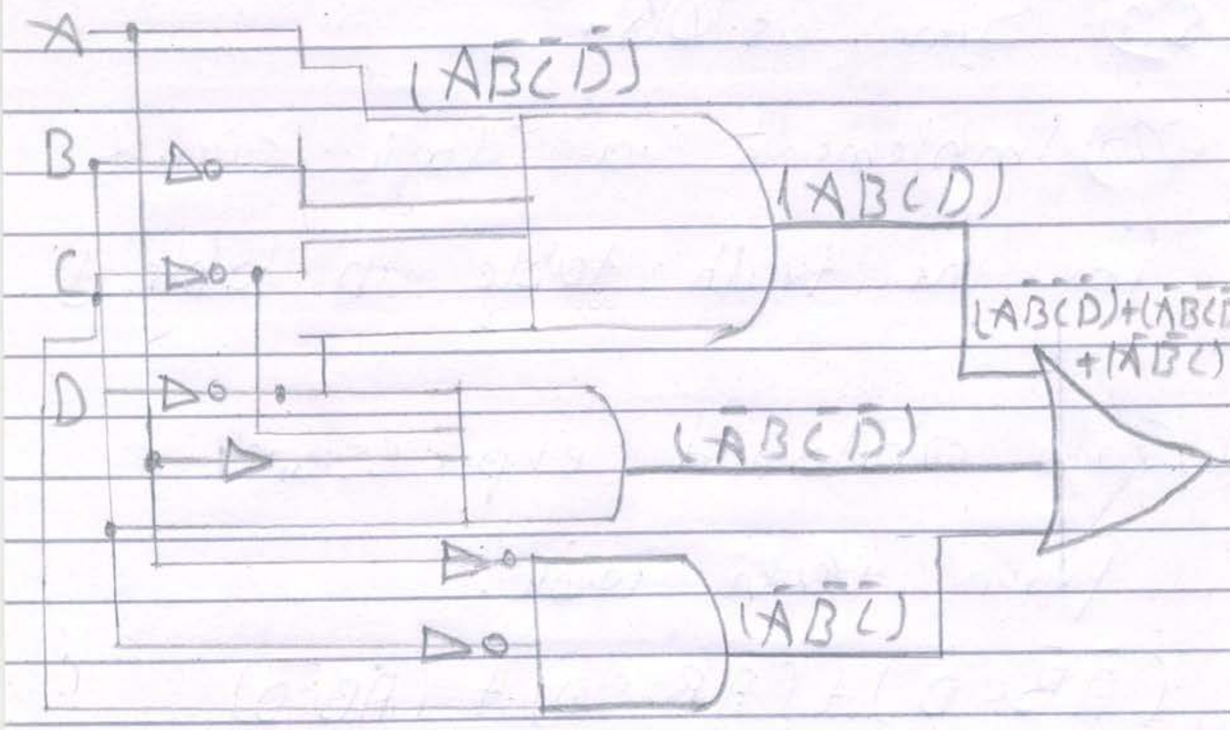


A
B
C
D
$(A\bar{B}C\bar{D})$
$(ABCD)$
$(ABCD)+(\bar{A}B\bar{C}\bar{D})+(\bar{A}\bar{B}C)$
$(\bar{A}BC\bar{D})$
$(\bar{A}\bar{B}C)$

Q19) Same as Q18.

Q20) Implement a logic circuit for the truth table in table (1)

Sol/ obtained expressions from truth table.

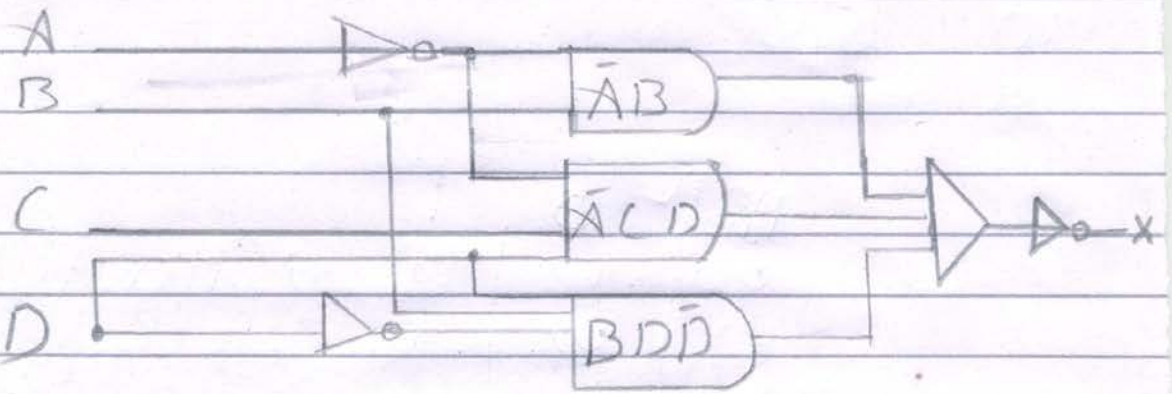
$(\bar{A}\bar{B}C\bar{D}) + (\bar{A}\bar{B}CD) + (\bar{A}B\bar{C}\bar{D})$

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

$+ (ABCD)$. by reducing the expression using boolean law and rules we get

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

Q17) Write the output expressions for the circuit given in figure.

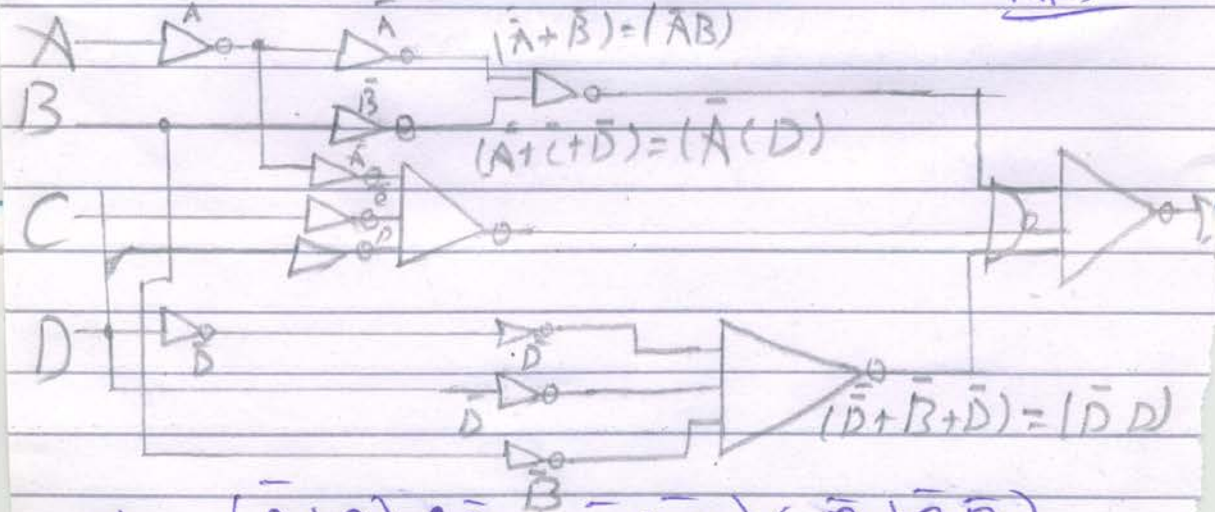


(Ans) $x = (\bar{A}B) + (\bar{\bar{A}}CD) + (BD\bar{D})$

Q18) Implement the logic circuit NOR Gate's.

$= \bar{A}B + (\bar{A}CD) + (\bar{D}BD)$

Ans



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

Q16) obtain the minimum pos expressions from Karnaugh map used in Q15

Sol/

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

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

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

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

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

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

$(A+B+C)$ Minimum pos expressions.

Q15) Use Karnaugh map to simplify the following expressions to min Sop form

Sol/ $\bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + AB\bar{C}$

$000 + 011 + 101 + 110$

AB \ C			
00	1		$(\bar{A}\bar{B}\bar{C})$
01		1	$(\bar{A}BC)$
11	1		$(AB\bar{C})$
10		1	$(A\bar{B}C)$

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

$+ (A\bar{B}C)$ is min Sop form.

Pos expressions;

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

$(A + C + D)$

Sop expressions

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

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

END of

PAPER

000, 010, 011, 001

the equvalent is

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

Q14) Draw a truth for both standard pos and Sop obtained in Q 12 and Q13

A	C	D	x	Pos / Sop
0	0	0	0	$(A+C+D)$
0	0	1	0	$(A+C+\bar{D})$
0	1	0	0	$(A+\bar{C}+D)$
0	1	1	0	$(A+\bar{C}+\bar{D})$
1	0	0	1	$(A\bar{C}\bar{D})$
1	0	1	1	$(A\bar{C}D)$
1	1	0	1	$(AC\bar{D})$
1	1	1	1	(ACD)

Q13) write the Standard POS exp using Standard SOP exp from Q12.

$C\bar{A}D + C\bar{A}\bar{D} + DA\bar{C} + ACD$

Sol/ ~~Exa~~ Evalution of the POS exp is

$(101) + (100) + (110) + (111)$

Since there are three variable in the domain of that expression. there are $2^3 = 8$ posible combination's four of which are combined

Term $D\bar{A}$ is missing C

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

term DD is missing A and C

$\Rightarrow DD = DD(A+\bar{A}) = DDA + DD\bar{A}$

Term DDA and $DD\bar{A}$ is missing C

$\Rightarrow DDA = DDA(C+\bar{C}) = DDAC + DDA\bar{C}$

$\Rightarrow DD\bar{A} = DD\bar{A}(C+\bar{C}) = DD\bar{A}C + DD\bar{A}\bar{C}$

Resulting SOP form is

$(C\bar{A}D + C\bar{A}\bar{D} + CDA + CD\bar{A}$

$+ D\bar{A}C + D\bar{A}\bar{C} + DDAC + DDA\bar{C}$

$+ DD\bar{A}C + DD\bar{A}\bar{C})$ Ans

Q12) convert the following expression's into Sop form

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

Sol/ first convert the Given expression's to Sop form.

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

Distributing

$$= C\bar{A} + CD + D\bar{A} + DD$$

$$\Rightarrow CA + CD + D\bar{A} + DD$$

Domain of the Sop is ACD
term CA is missing D.

$$\Rightarrow 1\ C\bar{A} = CA(D+\bar{D})$$

Term CD is missing A

Q11) using boolean algebra techniques simply the fallowing expressions as much as possible

$$A\bar{B} + A\bar{B}C + A\bar{B}CD$$

Sol// using Boolean Algebra Rule's

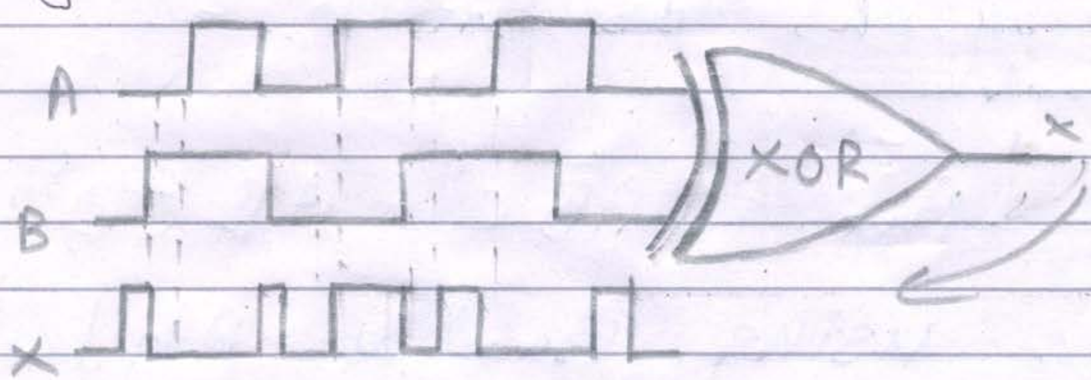
$$\underbrace{A\bar{B} + A\bar{B}C}_{(A + AB = A)} + A\bar{B}CD + A\bar{B}CDE$$

$$A\bar{B} + A\bar{B}CD + A\bar{B}CDE$$

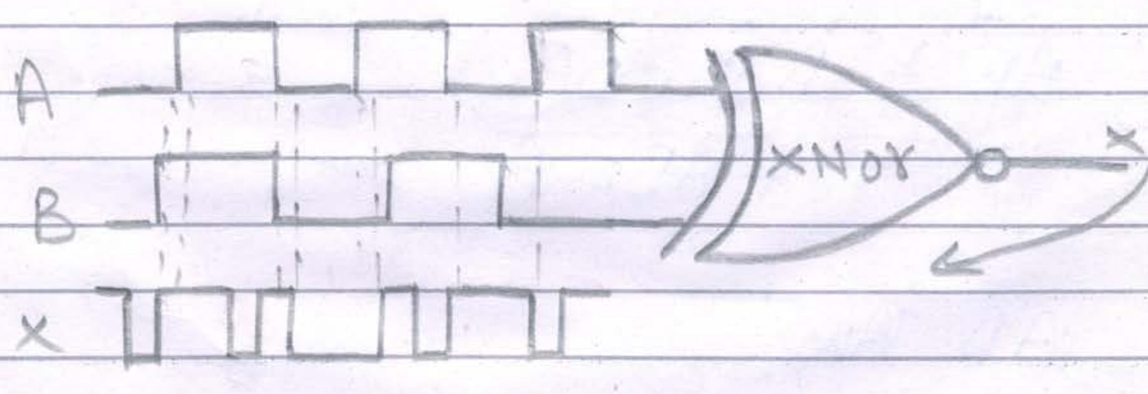
$$\underbrace{A\bar{B} + A\bar{B}CDE}_{A + AB = A}$$

$A\bar{B}$ (Ans)

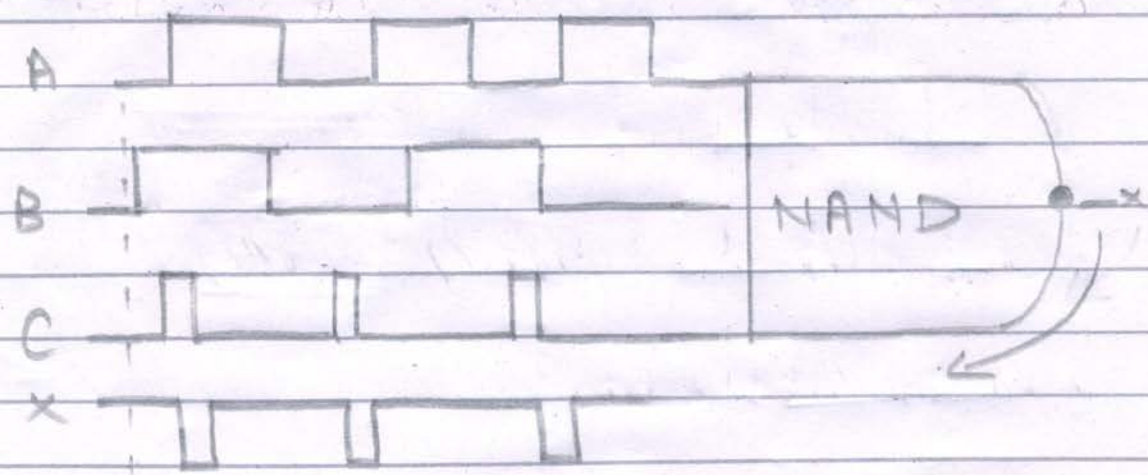
Q9) The input wave form's in figure are applied to a XOR gate Show the output waveform



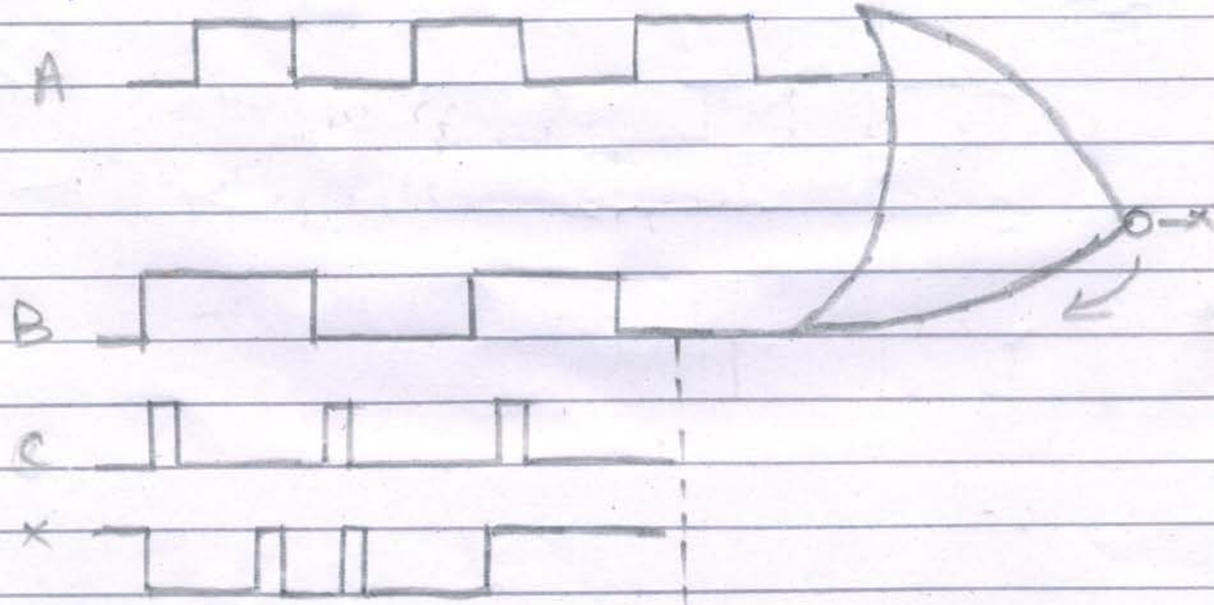
Q10) Repeat Q9 for XNOR Gate



Q7) Repeat Q5 for NAND Gate

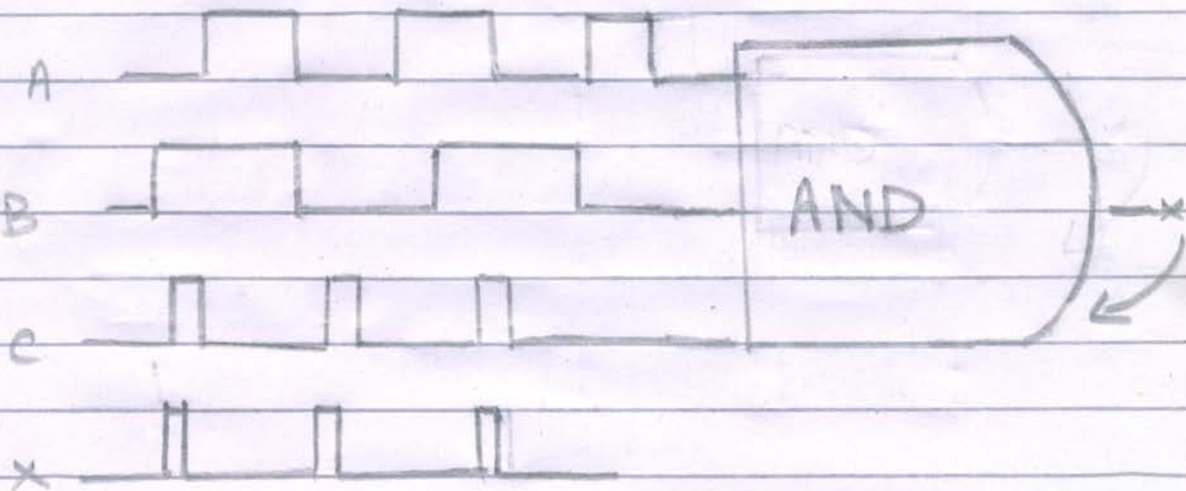


Q8) Repeat Q5 for Nor Gate

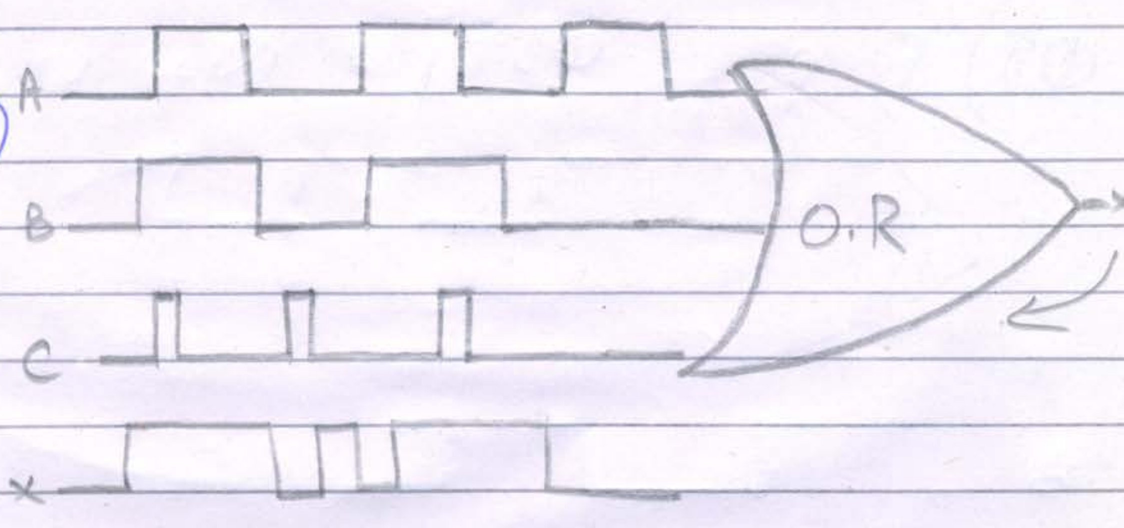


2c

Q5 The input waveform in figure are applied to



Q6 Repeat Q5 for OR Gate



Q4) Assume that code produced error in Q3 has error occur in the most signifi bit during transmission. Apply CRC to detect error

Sol// Data = D' = 0101 0011 0100

G = 1010

to detect the error in the in the transmited CRC code

```
0 1010 0 11 0100
1010
1111
1010
0101
1010
00000011 0
```

```
01000
1010
----
0010
```

Remainder $\neq 0$

(17)

$\frac{1100}{C}$, $\frac{0001}{1}$

(e) 00010110 BCD to 00010101 BCD = (?)10

Sol/

0001	0110
0001	0101
0010	1010 → Invalid due to (>9)

Add 6 to invalid code

0010	1011
	+ 0110
0011	. 0001

$\underbrace{0011}_{3}\ \underbrace{0001}_{1}$ Ans

(D) $6D_{16} - 3f_{16}$

Sol/ first converting both hex number's to binary

6 , D

0110 1001

$6D_{(16)} = 01101001$

$$\begin{array}{r} 6D \\ +\ C2 \\ \hline 12E \end{array}$$

12F Ans

3 , f

0011 1111

2's complement of 3f

$$\begin{array}{r} 00111111 \\ \hline 11000000 \end{array}$$ 1's complet

15

Adding 1 to Quotient

00000010

Again

$$
\begin{array}{r}
01000100 \\
+ \quad 11011110 \\
\hline
100100010
\end{array}
$$

Discard

Adding 1 to Quotient

= 00000011

Again

$$
\begin{array}{r}
00100010 \\
+ \quad 11011110 \\
\hline
00000000
\end{array}
$$

→ Discard

Adding 1 to Quotient

Quotient = 00000100 Ans

(13)

(b) $01101010_{(2)} \times 11110001_{(2)}$

Sol// using 2's complement

$$
\begin{array}{r}
11110001 \\
\hline
00001110 \quad \text{1's complement} \\
1 \quad \text{2's complement} \\
\hline
00001111
\end{array}
$$

$$
\begin{array}{r}
00001111 \\
01101010 \\
\hline
00000000 \\
100001111x \\
10000000xx \\
100001111xxx \\
00000000xxxx \\
000011111xxxxx \\
00001111xxxxxx \\
00000000xxxxxxx \\
\hline
000011000110110
\end{array}
$$

$1100011011 0_{(2)}$ Ans

(c) $10001000_2 \div 00100010_2$

Sol// Quotent = 00000000

Now Subtracting devisor from dividend using 2's complement

10001000 + 11011110 ——————— 10110 0110 ≥ Disivder	00100010 ——————— 11011101 1's com 1 2's com ——————— 11011110
Adding 1 to Quotient = 00000001	
Subtracting devisor from 1st partial remainder using 2's complement	
+ 01100110 ——————— 01000100	

(12)

Q2) carculate each of the following

a) 01111111 (2) — 00000111 (2)

Sol/ Taking 2's complement

$$
\begin{array}{rl}
 & 00000111 \quad 1^{s}\ \text{complmt} \\
+ & 11111000 \quad 2^{s}\ \text{complmt} \\
\hline
 & 11111001
\end{array}
$$

Now

$$
\begin{array}{rl}
 & 1111111 \\
 & 01111111 \\
+ & 11111000 \\
\hline
 & 101111000
\end{array}
$$

discarded bit's

01111000 (2) Ans

(P) 01000001 = (?) ASCII

Sol/ ASCII Equalant of $01000001_{(2)}$

using ASCII table

$(1 \times 2^6) + (1 \times 2^0)$
$(1 \times 64) + (1 \times 1)$

$64 + 1 = 65_{(10)}$
64_{10} = (A) ASSCII charater

(Q) 111000 = (3111000) Even parity

Sol// Attach Each even party to (111000)

Since there has to be even

amount of 1's in an even

parity number

1111000 => 1111000 Ans

(n) $1001010_{(2)}$ = (?) gray

Sol/ Gray eq of 1001010 (2)

$1 \rightarrow + 0 \rightarrow + 0 \rightarrow + 1 \rightarrow + 0 \rightarrow + 1$
$\rightarrow + 0$

1 1 0 1 1 1 1

• $1001010_{(2)}$ = 1101111 gray.

(o) 1010111 gray = $(?)_2$

Sol// Binary equivalent of 1010111

1 0 1 0 1 1 1 1

1 1 0 0 1 0 1 0

hence

1010111 gray = 1100101

(9)

)198 = (?) BCD

Sol// Convert given decimal to binary added deimal.

Using Decimal - BCD table

$\frac{1}{0001}$, $\frac{9}{1001}$, $\frac{8}{1000}$

198(10) = 000110011000 BCD

(M) 100001110000 BCD = (?)10

Sol// Decimal equalant at Given BCD Number's.

Now, using BCD Decimal table

$\frac{1000}{8}$, $\frac{0111}{7}$, $\frac{000}{0}$

100001110000 BCD = 870(10)

Since the Sign bit is 1.

hence $11111111_{(2)} = -127_{(10)}$

(k) $-12_{(10)} = (?)_2$

Sol/ Binary equvalent of $-12_{(10)}$ first find Binary equvalent of $12_{(10)}$ using Repeated divison by 2

2	12	
2	6	0
2	3	0
2	1	1

$12_{(10)} = 1100_{(2)} \Rightarrow 00001100_{(2)}$

Now taking 2's complement of obtained nbr.

0000 1100 1's complement

1111 0011 2's complement

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$\frac{000}{0}, \frac{010}{2}, \frac{101}{5}, \frac{001}{1}, \frac{111}{7}, \frac{101}{5}$

$2A7D_{(16)} = 25175_{(8)}$

(J) $11111111_{(1)} = \pm (2)_{10}$

Sol/ Decimal value of the given Signed number

Now,
Using weighted notatation of magnitude bit's

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

$= (64) + (37) + (16) + (8) + (4)$

6

Using Repeated division by 8

$$\begin{array}{r|l} 8 & 169 \\ 8 & 21-1 \\ 8 & 2-5 \end{array}$$

$169_{(10)} = (251)_8$.

ii) $2A7D_{(16)} = (?)_8$

Sol/ Octal Equalant of $2A7D_{(16)}$

first convert $2A7D_{(16)}$ to binary number using grop of four

$\frac{2}{0010}$, $\frac{A}{1010}$, $\frac{7}{0111}$, $\frac{D}{1101}$

Now convert the obtained binary number's into octal

(g) $6173_{(8)} = (?)_{10}$

Sol/

Using weighted Notation

$(6 \times 8^3) + (1 \times 8^2) + (7 \times 8^1)$

$+ (3 \times 8^0)$

$\Rightarrow (6 \times 512) + (1 \times 64) + (7 \times 8) + (3 \times 1)$

$\Rightarrow (3072) + (64) + (56) + (3)$

$\Rightarrow (3195)_{(10)}$

$6173_{(8)} = 3195_{(10)}$

(h) $169_{(10)} = (?)_8$

Sol//

Octal Equivalent of

(4)

Using hex-binary table

to convert 3A6f (16) to binary

$\frac{3}{0011}$, $\frac{A}{1010}$, $\frac{6}{0110}$, $\frac{f}{1111}$

hence

3A6f (16) = 11 1010 0110 1111 (2)

(f) 11 0000 11 111 00 101 (2) = (?)16

Ans) hex equalant of given binary using group of four.

$\frac{1100}{C}$, $\frac{0011}{3}$, $\frac{1110}{E}$, $\frac{0101}{5}$

11 0000 11111 00 101 (2) => C3E5 (16)

C3E5 (16)

(D) $128_{(10)} = (?)_{16}$

Sol/ Hex equilant of the Given decimel

Using Repeated division by 16

$$\begin{array}{r|l} 16 & 128 \\ 16 & 8 - 0 \end{array}$$

hence

$$128_{(10)} = (80)_{16}$$

(e) $3A6f_{(16)} = (?)_{10}$

Sol/ convert hex number to decimal.

(b) $10000000.1010_2 = (?)_{10}$

Sol/ convert the binary number to decimal.

using weighted notation.

$(1 \times 2^7) + (1 \times 2^{-1}) + (1 \times 2^{-4})$

$\Rightarrow (1 \times 128) + (0.5) + (0.125)$

$\Rightarrow 128.625_{(10)}$ Answer.

(c) $407f_{(16)} = (?)_{10}$

Ans/ convert Hexa to decimal

$(4 \times 16^3) + (13 \times 16^2) + (7 \times 16^1)$

$+ (15 \times 16^0)$

$= (4 \times 4096) + (13 \times 256) + (7 \times 16)$

$+ (15 \times 1)$

Q1:- Convert each of the following

(a) 45.25_{10}

Ans/ 42.25_{10} to binary number

using repeated division P 45

2	45
2	22 - 1
2	11 - 0
2	5 - 1
2	2 - 1
2	1 - 0

$(45)_{10} = (101101)_2$

Now for fractional part we use repeated multiplication method.