Q1. Convert the following:-

a (i) $45.25_{10} = (?)_2$

Sol:-

into binary

45

$\Rightarrow 32 + 8 + 4 + 1$

$\Rightarrow 2^5 + 2^3 + 2^2 + 2^0$

$\Rightarrow 101101.01$ Ans

0.25

$\Rightarrow 2^{-2}$

$\Rightarrow 01$

$2^{-1} \Rightarrow 0.5$

$2^{-2} \Rightarrow 0.25$

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

Sol:-

$\Rightarrow 1\times2^8 + 0\times2^7 + 0\times2^6 + 0\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 0\times2^0$

$\Rightarrow 128 \times 1$

$\Rightarrow 128.625$ Ans

0.1010

$\Rightarrow 1\times2^{-1} + 1\times2^{-3}$

$\Rightarrow 2^{-1} + 2^{-3}$

$\Rightarrow 0.5 + 0.125$

$\Rightarrow 0.5$

0.125

0.625

iii) $4D7F_{16} = (?)_{10}$

Sol:- Hexa into Decimal

4 D 7 F

0100 1101 0111 1111 ← Hexa into binary

$\Rightarrow 2^{14} + 2^{11} + 2^{10} + 2^8 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0$ ← binary to decimal

$\Rightarrow 16,384 + 2048 + 1024 + 256 + 128 + 64 + 32 + 16 + 8 + 4 + 2 + 1$

$\Rightarrow 19,967$ Ans

(c) ~~4D7F~~

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

Sol:-

$16 \overline{)128} \; 8$, 128, 0

$16 \overline{)0} \; 0$, 0

$\Rightarrow \frac{8}{16} \Rightarrow 0.5$

$16 \overline{)80} \; 0.5$, 80, 0

$\Rightarrow 0 \times 16 \Rightarrow 0$

$\Rightarrow 0.5 \times 16 \Rightarrow 8$

$\Rightarrow 80$ Ans

(e) $3A6F_{16} = (?)_2$

Hexa into binary

Sol:-

3	A	6	F
0011	1010	0110	1111

$\Rightarrow$ 2nd Compliment

$\Rightarrow$ 1000101 1001 0001 binary

(f.) $\underbrace{1}\underbrace{100}\underbrace{0011}\underbrace{1110}\underbrace{0101}_2 = (?)_{16}$

Sol:- Binary into Hexa

$\Rightarrow C3E5_{16}$ //

(g) $6173_8 = (?)_{10}$

Sol:-

$\Rightarrow (6\times8^3)+(1\times8^2)+(7\times8^1)+(3\times8^0)$

$\Rightarrow (6\times512)+(1\times16)+(7\times8)+(3\times1)$

$\Rightarrow 3072+16+56+3$

$\Rightarrow 3117$ Ans

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

67
50
117

Decimal to octal

$\Rightarrow \frac{169}{8} \Rightarrow 21.125 \rightarrow 0.125\times8 = 1$ Remindes

$\frac{21}{8} \Rightarrow 2.625 \rightarrow 0.625\times8 = 5$

$\frac{2}{8} \Rightarrow 0.25 \rightarrow 0.25\times8 = 2$

octal Numbes

2 5 1

MSD LSD

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

Sol:- Hexa to Octal

⇒ 2 A 7 D

* Hexa to Binary

0010 1010 0111 1101

* Binary to Octa

⇒ 2 5 1 7 5

⇒ $25175_{(8)}$

(ii) $11111111_2 = \pm(?)_{10}$

Binary into decimal

Sol:-

⇒ $2^7 + 2^6 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0$

⇒ $128 + 64 + 32 + 16 + 8 + 4 + 2 + 1$

⇒ $128 + 127$

⇒ $+256$ in '+'

2^{nd} Complement.

⇒ 00000001

⇒ 2^0

⇒ 1 in "-"

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

Sol:-

⇒ 8 + 4

⇒ $2^3 + 2^2$

⇒ 1100 ('1' show '-' sign)

⇒ 2nd Complement

⇒ 0100 //; Ans

(l) $198_{10} = (?)_{BCD}$

Sol:- Decimal into Binary Coded Decimal

⇒ 1 9 8

⇒ 0001 1001 1000 BCD

⇒ Ans

(m) $100001110000_{BCD} = (?)_{10}$

Sol:-

⇒ 8 7 0

⇒ 870_{BCD}

Ans

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

Sol:-

⇒ 1 → 0 → 0 → 1 → 0 → 1 → 0

⇒ 1 1 1 1 1 1 1 // Grey

(o) $[01011111_{Grey} \Rightarrow (?)_2$

Sol:-

⇒ 10101111

⇒ 1 1 0 0 1 0 1 0 $_2$

(p) 01000001 = (?) ASCII

Sol:- it's ASCII of 'A'

(q) 1111000 = (?1111000) even posity

Sol:- it's

⇒ 1 1111000 "1" in even posity

Q2. Calculate

(a) $01111111_2 - 00000111_2$

Sol:-

2nd Complement of 00000111 is

⇒ 11111001 (2nd Method)

```
  ⇒  01111111
   + 11111001
(1 discard) 01111000   ← Ans
```

(b) $01101010_2 \times 11110001_2$

Sol:- Multiplicand × multiplies

* Sign bit of Multiplies is '1' (negative)
* 2nd Complimant of Multiplies

⇒ 00001111

```
  01101010  Mutiplicant
x 00001111  Multiplies
----------
  01101010  1st partitial product
+ 01101010x
----------
  00111110  Sum of 1st & 2nd
+ 00000000xx  3rd partial product.
----------
  00101110  Sum
  0101 0xxx  4th partial prod.
----------
  10001110  Sum
+ 1010xxxx
```

00100110 Sum

1001000001 5th partial prod

Final product

(c) $10001000_2 \div 00100010_2$

Sol:-

```
  10001000
+ 11011110   2nd Compliment of devisor.
----------
  01100110   '+'ve
```

Add 1 in Quotient 00000000 + 00000001

⇒ 00000001

```
  01100110   Remainder
+ 11011110   2nd C of Divisor
----------
  01000100
```

Add 1 more 00000010 + 00000001

⇒ 00000011.

```
  01000100
  11011110
----------
  00100110
```

Add 1 more 00000011 + 00000001

⇒ 00000100 Ans

```
  00100110
+ 11011110
----------
  00000000
```

(d) $6D_{16} - 3F_{16}$

Sol:-

$\Rightarrow 3F_{16}$

$\Rightarrow 00111111$

$\Rightarrow 11000001$ 2nd C R-w

$\Rightarrow$ C 1

$16\overline{)19}\,(1$
$\underline{16}$
4

$\Rightarrow 6D$
$+C1$
$\overline{\times 2E}$
↓
'1' exclude

$\Rightarrow 2E$ difference

(e) $00010110_{BCD} + 00010101_{BCD} = (?)_{10}$

$00\overset{1}{0}1\ \overset{1}{0}110$
$+\ 0001\ 0101$
$\overline{0010\ 1011}$

R-w
96
15
31

Question 3: Apply CRC to the →?

Ans

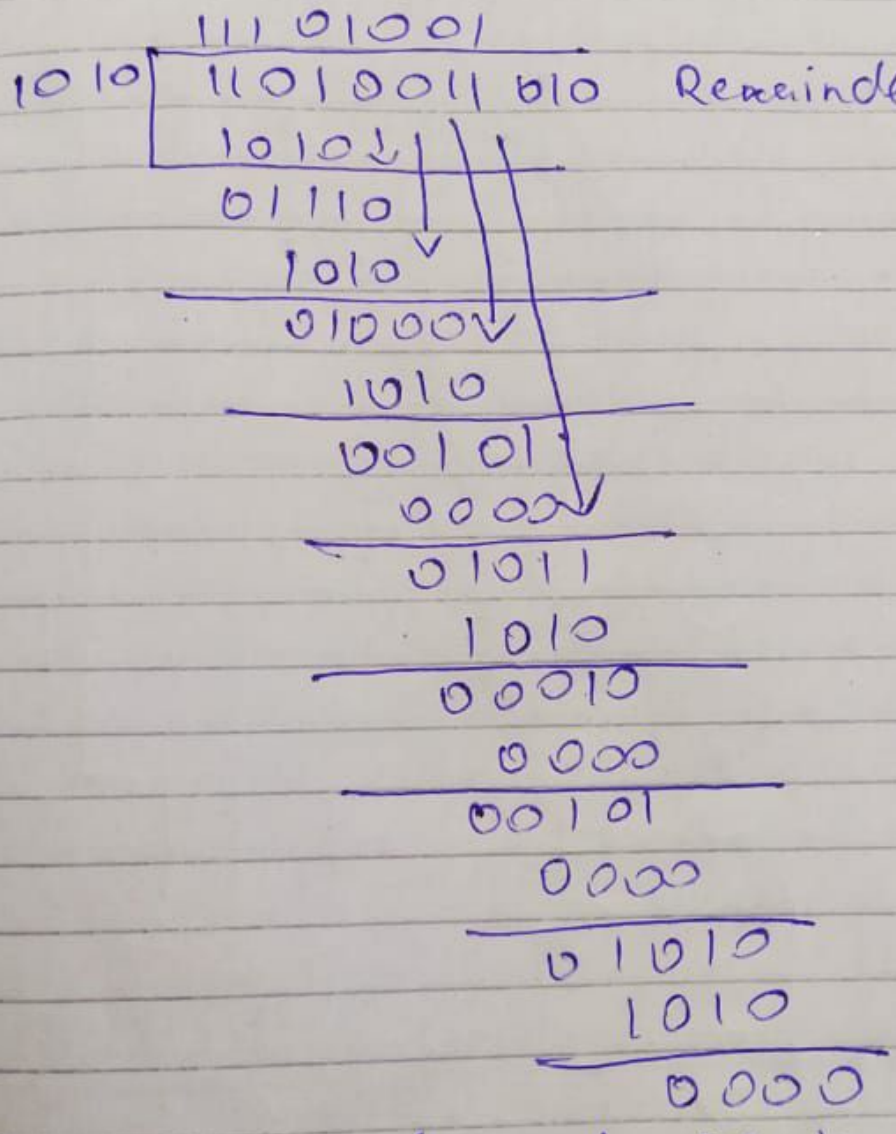
```
         1110 1001
1010 | 1101001 1000 0
       1010↓
        01110
         1010↓
        01000
          1010↓
        00101
          0000
         01011
           1010
          00010
           0000
           00100
            0000
            01000
             1010
             0010 ⇒ Remainder
```

1110 1001

Q4: Answer that ——— ?

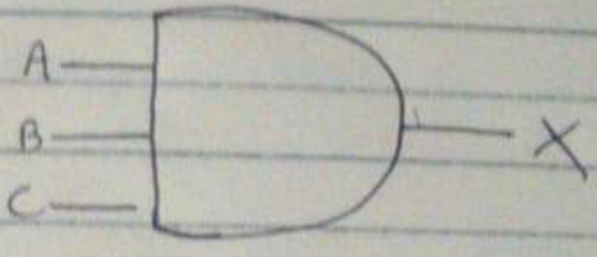
Answer:

The remainder is not zero so we will apply CRC



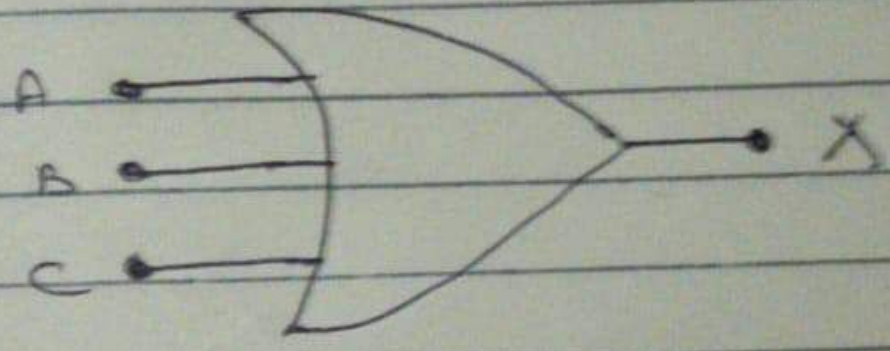
Tranmitted code without error.

Q5)

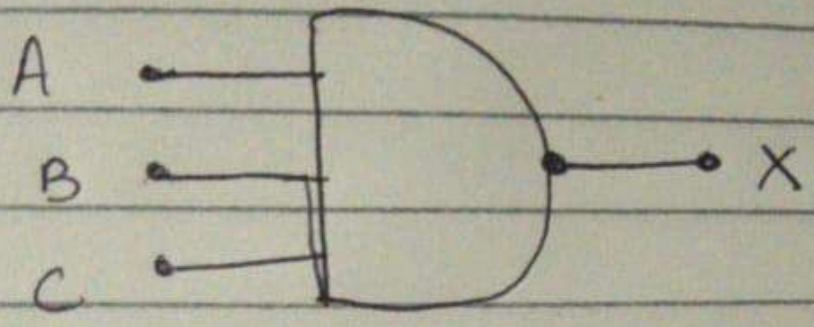


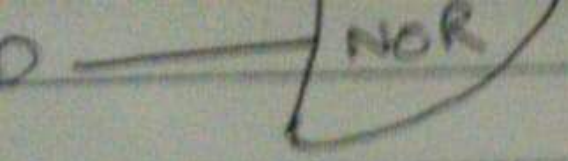
B
C
X

Q6) 3-input OR gate

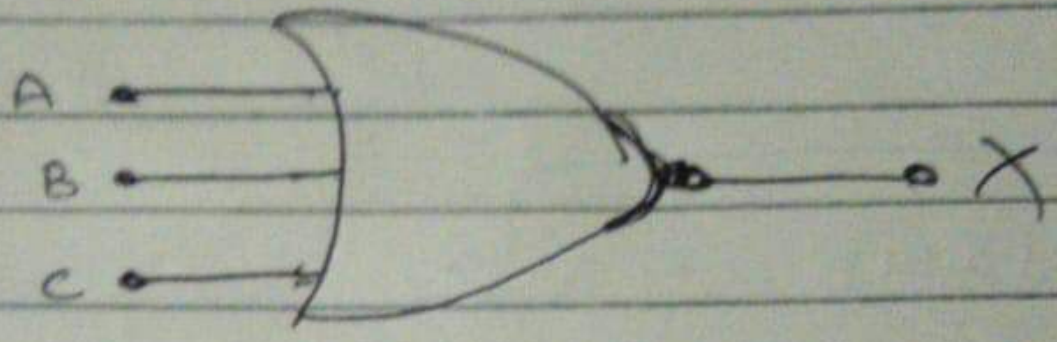


Q7 3-input NAND gate

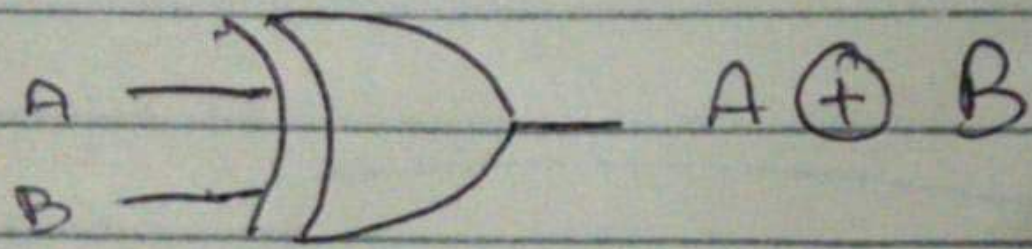




eg:) 3-input NOR gate



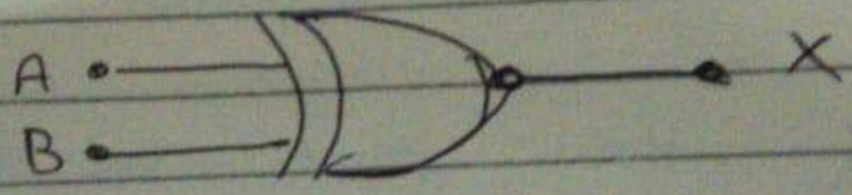
Q9 XOR Gate



(c) Draw the rooted trees in the full m-ary tree for sum pos nms.

Graph already did T_1, T_2

Q10) XNOR



Q11 Using ---- --

Sol:-

Using boolean Algebra

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

$$\Rightarrow \frac{A\bar{B} + A\bar{B}CD + A\bar{B}CDE}{A + AB = A}$$

$$\Rightarrow \frac{AB + A\bar{B}CDE}{A + AB = A}$$

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

Q12 $(C+D)(\bar{A}+D)$

Sol:- into SOP form

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

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

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

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

Q13, $(C\cdot\bar{D}) + (A\cdot\bar{D})$

Sol:- int standard POS

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

$$\Rightarrow \overline{(C\cdot\bar{D})}\cdot\overline{(A\cdot\bar{D})}$$

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

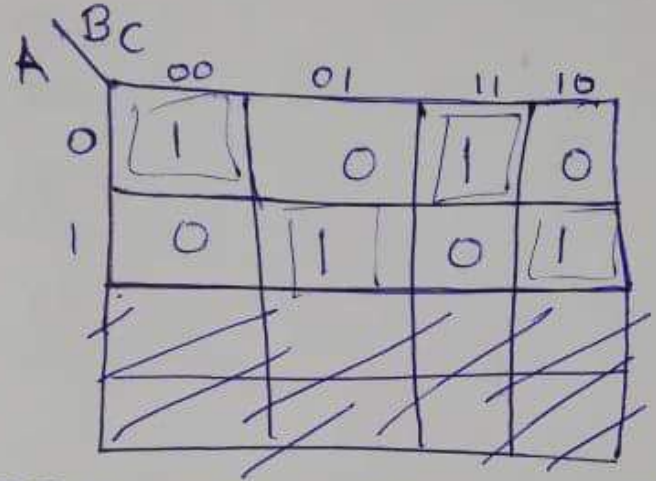
Ans

Q15. $\Rightarrow \bar{A}\bar{B}\bar{C} + \bar{A}BC + A\bar{B}C + AB\bar{C}$

use Karnagh Map to Simplify

min SOP $2^3 = 8$

Sol:-

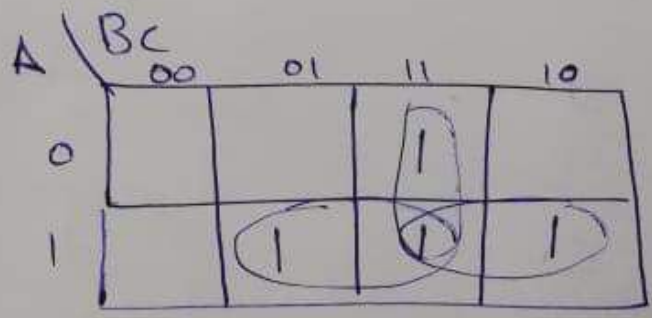


$A = 1$

$\bar{A} = 0$

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

Q16, obtain min POS.



$A = 0$

$\bar{A} = 1$

1st $\Rightarrow \bar{A}\bar{C}$

2nd $\Rightarrow B\bar{C}$

3rd $\Rightarrow \bar{A}\bar{B}$

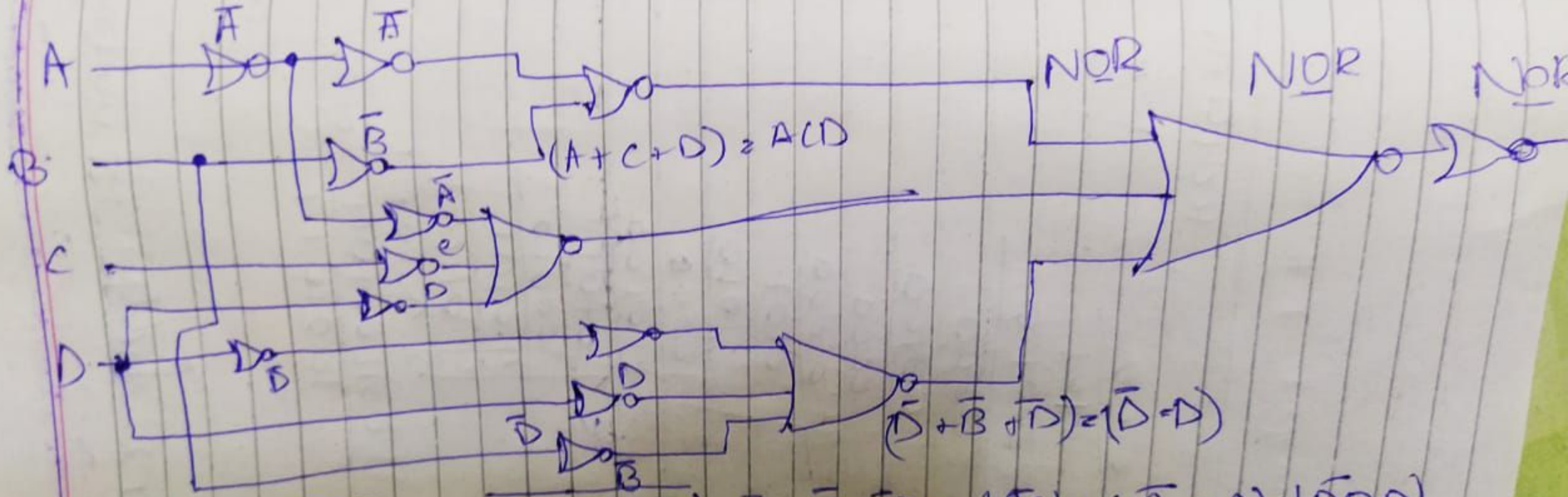
$\Rightarrow \bar{A}\bar{C} + B\bar{C} + \bar{A}\bar{B}$

Ans

Q17 Generate out-put, expression.

A	B	C	D	x
0	0	0	0	1
0	0	0	1	1
0	0	1	0	1
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	1
1	0	0	1	1
1	0	1	0	1
1	0	1	1	1
1	1	0	0	1
1	1	0	1	1

Q18 Implement ---- ?



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

Q20 Implement a logic circuit ?

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

by boolean rules and law we get

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