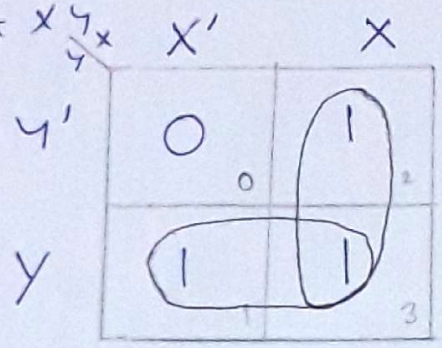
① Simplify the Boolean function $X'Y + XY' + XY$ using K-map.

Ans: $X'Y + XY' + XY$



Group I:
Y

Group II:
X

$\therefore X'Y + XY' + XY = X + Y$

② Simplify the Boolean function $A'C + A'B + AB'C + BC$ and draw the logic diagram of simplified function.

Ans: $F = A'C + A'B + AB'C + BC$

$F = A'(0+1)C + A'B(0+1) + AB'C + (0+1)BC$

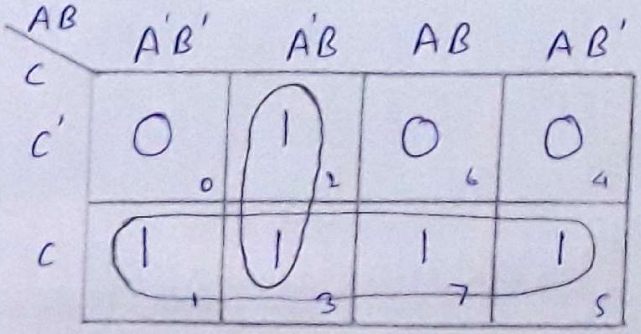
$F = A'(B'+B)C + A'B(C'+C) + AB'C + (A'+A)BC$

$F = A'B'C + A'BC + A'BC' + A'BC + AB'C + A'BC + ABC$

$F = A'B'C + A'BC + A'BC' + AB'C + ABC$

$F = m_1 + m_3 + m_2 + m_5 + m_7$

$F = \Sigma m(1, 2, 3, 5, 7)$



Group I:
$A'B$

Group II:
C

$\therefore A'C + A'B + AB'C + BC = A'B + C$

(3) Reduce the expression $F = \Sigma m(0, 1, 2, 3, 6, 7, 13, 15)$ and implement in NAND Logic.

Ans:

K-Map:

CD \ AB	A'B'	A'B	AB	AB'
C'D'	1 (0)	0 (4)	0 (12)	0 (8)
C'D	1 (1)	0 (5)	1 (13)	0 (9)
CD	1 (3)	1 (7)	1 (15)	0 (11)
CD'	1 (2)	1 (6)	0 (14)	0 (10)

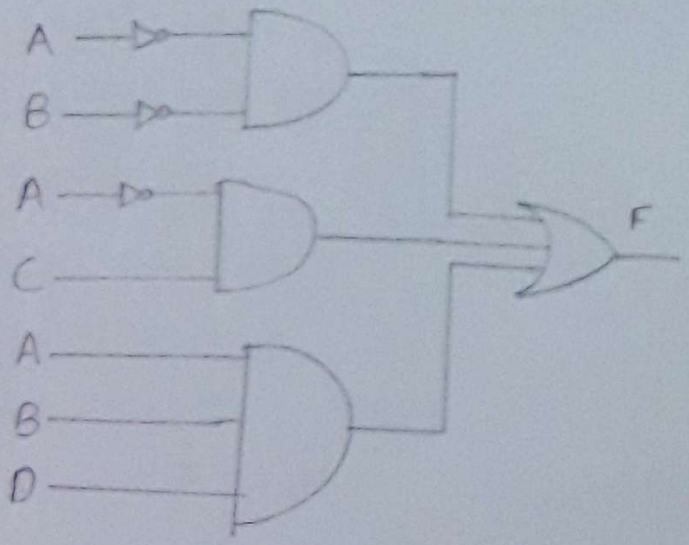
Group I: ABD

Group II: A'B'

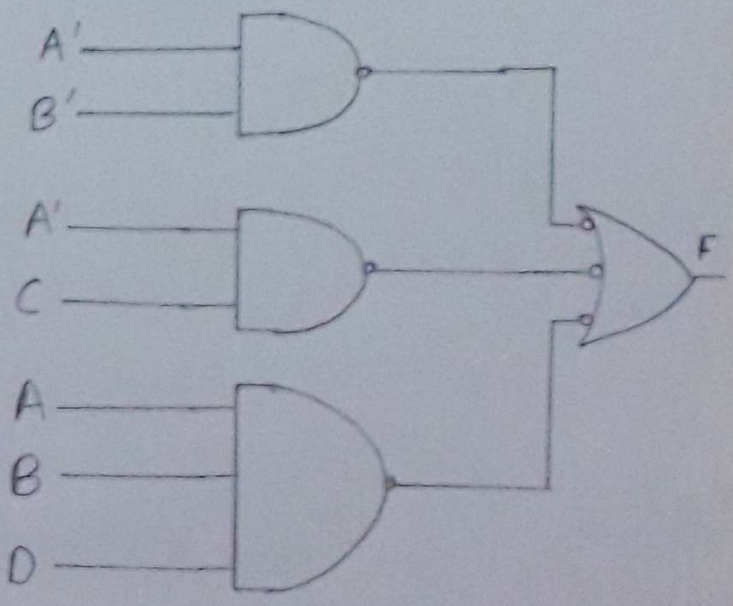
Group III: CA'

$\therefore F = \Sigma m(0, 1, 2, 3, 6, 7, 13, 15) = A'B' + A'C + ABD$

Logic circuit:



Equivalent Logic circuit using NAND Gate



$F = A'B' + A'C + ABD$

④ $(125.17)_{10} = (\ ?\ )_2$

Ans:

125.17

		R
2	125	1
2	62	0
2	31	1
2	15	1
2	7	1
2	3	1
	1	

1111101

R : Remainder

$0.17 \times 2 = 0.34$ → 0

$0.34 \times 2 = 0.68$ → 0

$0.68 \times 2 = 1.36$ → 1

$0.36 \times 2 = 0.72$ → 0

$0.72 \times 2 = 1.44$ → 1

00101

∴ Ans : $(1111101.00101)_2$

⑤ $(111001.101)_2 = (\ ?\ )_{10}$

Ans : $(111001.101)_2$

$= 1 \times 2^5 + 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0 + 1 \times 2^{-1} + 0 \times 2^{-2} + 1 \times 2^{-3}$

$= 32 + 16 + 8 + 0 + 0 + 1 + \frac{1}{2} + 0 + \frac{1}{8}$

$= 32 + 16 + 8 + 0.5 + 0.125$

$= 57.625$

∴ Ans : $(57.625)_{10}$

⑥ $(21.21)_8 = (\ ?\ )_{10}$

Ans: $(21.21)_8$

$= 2\times8^1 + 1\times8^0 + 2\times8^{-1} + 1\times8^{-2}$

$= 16 + 1 + 0.25 + 0.015625$

$= 17.265625$

⑦ $(175.169)_{10} = (\ ?\ )_8$

Ans: $(175.169)_{10}$

		R
2	175	1
2	87	1
2	43	1
2	21	1
2	10	0
2	5	1
2	2	0
	1	

10101111

$0.169 \times 2 = 0.338$ → 0

$0.338 \times 2 = 0.676$ → 0

$0.676 \times 2 = 1.352$ → 1

$0.352 \times 2 = 0.704$ → 0

$0.704 \times 2 = 1.408$ → 1

$0.408 \times 2 = 0.816$ → 0

$0.816 \times 2 = 1.632$ → 1

$0.632 \times 2 = 1.264$ → 1

$0.264 \times 2 = 0.528$ → 0

00101011_0

$01010111 \cdot 00101011_0$

2 5 7 1 2 6

$\therefore (175.169)_{10} = (257.126)_8$

(8) $(EF.B1)_{16} = (?)_{10}$

Ans: $(EF.B1)_{16}$

$= 14 \times 16^{1} + 15 \times 16^{0} + 11 \times 16^{-1} + 1 \times 16^{-2}$

$= 224 + 15 + 0.6875 + 0.00390625$

$= 239.69140625$

$\therefore (EF.B1)_{16} = (239.69140625)_{10}$

(9) $(76.234)_{10} = (?)_{16}$

Ans:

$(76.234)_{10}$

16	76	R
	4	C

4C

$0.234 \times 16 = 3.744$ → 3

$0.744 \times 16 = 11.904$ → B

$0.904 \times 16 = 14.464$ → E

3BE

$\therefore (76.234)_{10} = (4C3BE)_{16}$

(10) $(10110.01)_{2} = (?)_{8}$

Ans: $(10110.010)_{2}$

$= \underbrace{010}_{2}\ \underbrace{110}_{6} \cdot \underbrace{010}_{2}$

$\therefore (10110.010)_{2} = (26.2)_{8}$

(11) $(10110.01)_2 = (?.)_{16}$

Ans: $(10110.01)_2$

$= \underbrace{0001}_{1}\ \underbrace{0110}_{6} . \underbrace{0100}_{4}$

$\therefore (10110.01)_2 = (16.4)_{16}$

(12) $(25C.F3)_{16} = (?.)_2$

Ans:

2	5	C	.	F	3
↓	↓	↓		↓	↓
0010	0101	1100		1111	0011

$\therefore (25C.F3)_{16} = (0010\,0101\,1100 . 1111\,0011)_2$

$\therefore (25C.F3)_{16} = (1001011100 . 11110011)_2$

(13) $(256.13)_8 = (?)_2$

Ans:

2	5	6	.	1	3
↓	↓	↓		↓	↓
010	101	110		001	011

$\therefore (256.13)_8 = (10101110 . 001011)_2$

(14) $(1076)_8 = (?)_{16}$

Ans: $(1076)_8$

$$= \underset{\downarrow}{1}\ \underset{\downarrow}{0}\ \underset{\downarrow}{7}\ \underset{\downarrow}{6}$$
$$\quad\ 001\ \ 000\ \ 111\ \ 110$$

$\therefore (1076)_8 = (1000\ 111\ 110)_2$

$$001\ 000\ 111\ 110$$
$$\quad\ 2\ \ 3\ \ E$$

$\therefore (1076)_8 = (23E)_{16}$

(15) $(1F0C)_{16} = (?)_8$

Ans: $(1F0C)_{16}$

$$= \underset{\downarrow}{1}\ \ \underset{\downarrow}{F}\ \ \underset{\downarrow}{0}\ \ \underset{\downarrow}{C}$$
$$\quad 0001\ \ 1111\ \ 0000\ \ 1100$$

$\therefore (1F0C)_{16} = (1111000011100)_2$

$$001\ \ 111\ \ 100\ \ 001\ \ 100$$
$$\quad\ 1\ \ 7\ \ 4\ \ 1\ \ 4$$

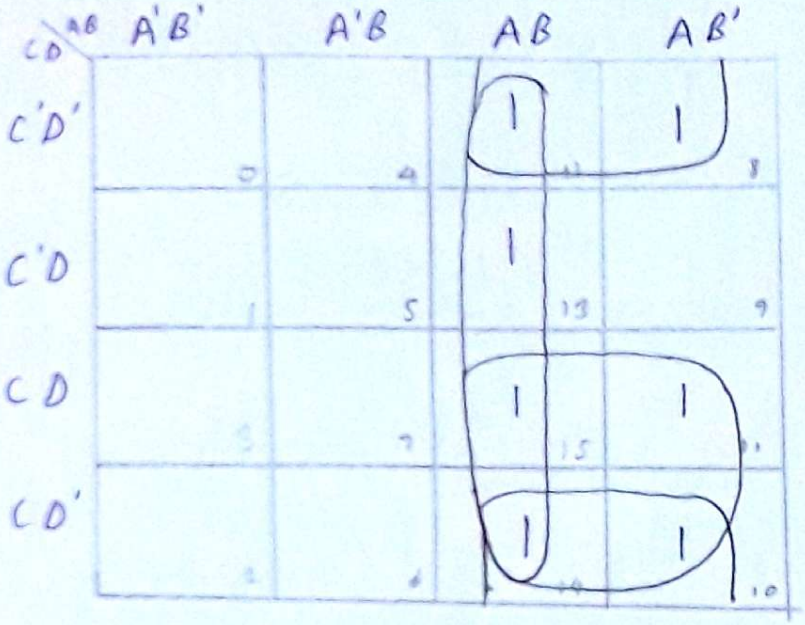
$\therefore (1F0C)_{16} = (17414)_8$

(16) Reduce the expression using k-map and draw its logic diagram.

$$F = \Sigma m(8, 10, 11, 12, 13, 14, 15)$$

Ans:

K map:



Group 1: AB

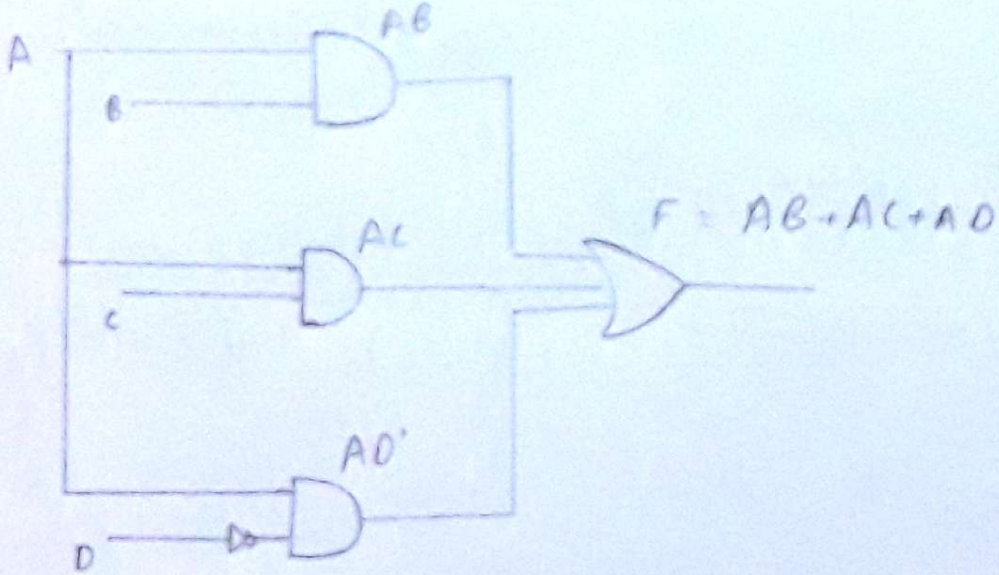
Group 2: AC

Group 3: AD'

$F = \Sigma m(8, 10, 11, 12, 13, 14, 15)$

$= AB + AC + AD'$

Logic circuit:

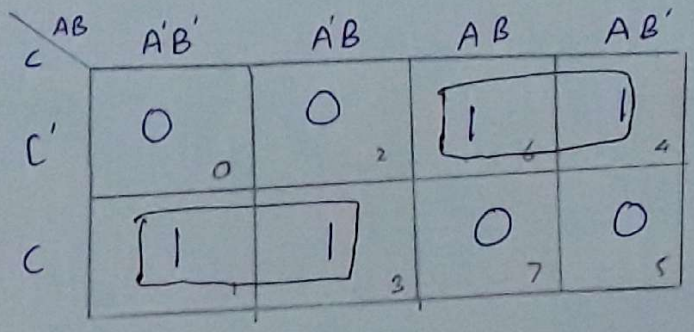


(17) Write the Boolean equation for the function given in table and reduce the same using K-map.

input			output
A	B	C	F
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

Ans: $F = A'B'C + A'BC + AB'C' + ABC'$

$F = m_1 + m_3 + m_4 + m_6$



Group I: AC'

Group II: $A'C$

$\therefore F = AC' + A'C$

(18) Reduce the expression using K-map and draw its logic diagram.

$$F(A, B, C, D) = \Sigma m(0, 2, 8, 10, 14)$$

Ans:

K map:

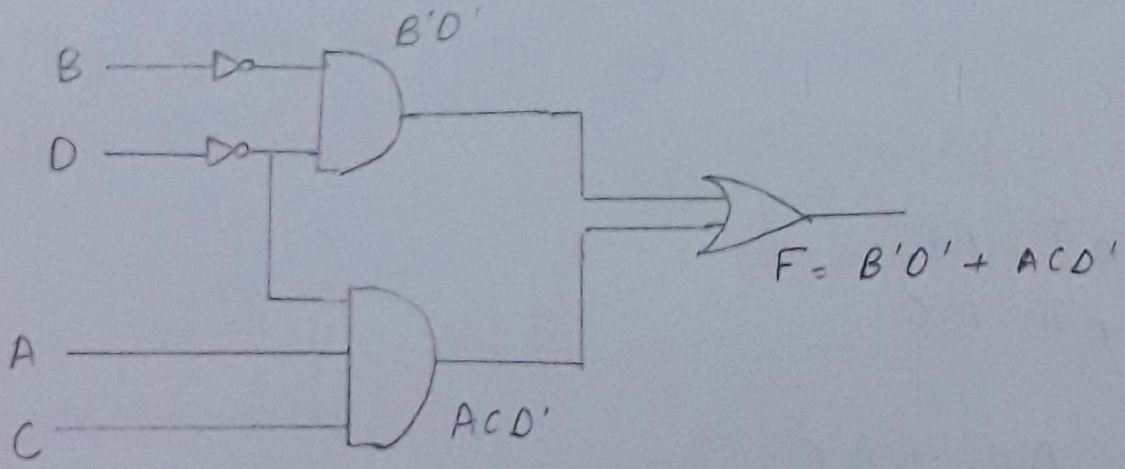
CD \ AB	A'B'	A'B	AB	AB'
C'D'	1 (0)	0 (4)	0 (12)	1 (8)
C'D	0 (1)	0 (5)	0 (13)	0 (9)
CD	0 (3)	0 (7)	0 (15)	0 (11)
CD'	1 (2)	0 (6)	1 (14)	1 (10)

Group I: $B'D'$

Group II: ACD'

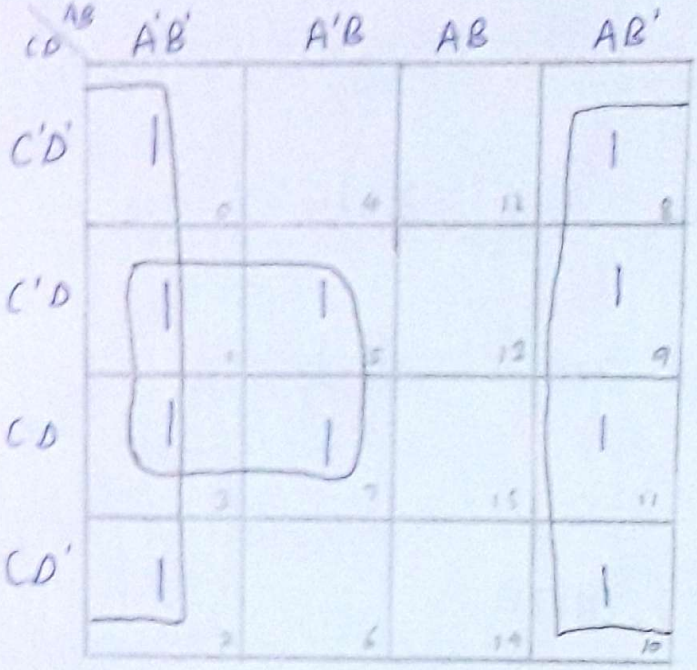
$\therefore F = B'D' + ACD'$

Logic circuit:



(19) $F(A, B, C, D) = \sum m(0, 1, 2, 3, 5, 7, 8, 9, 10, 11)$

Ans: K-Map:

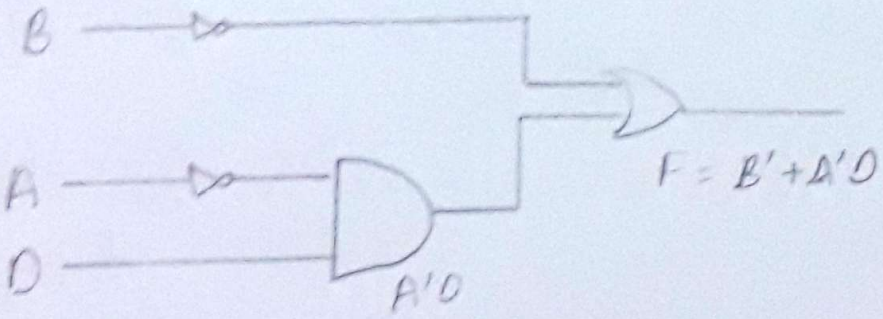


Group I: B'

Group II: $A'D$

$\therefore F = B' + A'D$

Logic Circuit:



(20) Convert the octal number $(127.35)_8$ to hexadecimal $(\ )_{16}$

Ans: $(127.35)_8$

$= (1 \quad 2 \quad 7 \quad . \quad 3 \quad 5)_8$

$= (001 \quad 010 \quad 111 \quad 011 \quad 101)_2$

$= (1010111.011101)_2$

$= (0101 \quad 0111 \quad . \quad 0111 \quad 0100)_2$

$= (5 \quad 7 \quad . \quad 7 \quad 4)_{16}$

$\therefore (127.35)_8 = (57.74)_{16}$