Free Study Material from All Lab Experiments

Electronics for NET/Gate Physical Sciences # Codes

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05 | Aug | 2014

Codes

Gray Code :-

The outer boundary of K-map is designed on the basis of Gray Code.

- It is called unweighted code.

Weighted Code :-

If each and every bit is having significant positional value then such code is called as weighted code.

ex- (i) 8 4 2 1
(ii) 5 2 1 1
(iii) 3 3 2 1

If each and every bit does not have significant positions such codes are called as unweighted code.

e.g. Gray Code, Excess-3 code.

- Gray Code is also called as unit distance code.
- Gray code is also called as cyclic code.

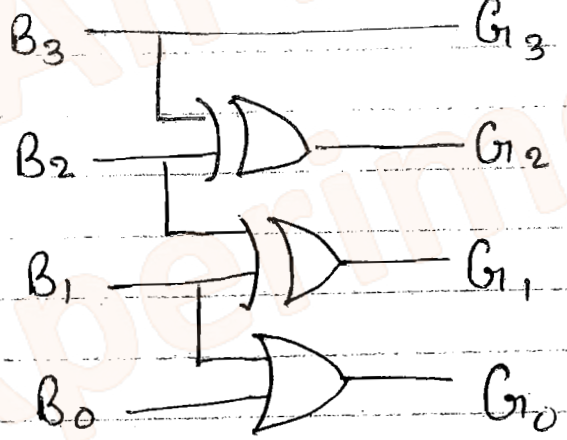
* Basic formation of Gray Code :-

B_3	B_2	B_1	B_0
1	1	0	1
G_3	G_2	G_1	G_0
1	0	1	1

In the binary to gray conversion M.S.B. written as it is and side by side ex-OR operation is perform (Sum is taken Carry is discarded)

B_3	B_2	B_1	B_0	G_3	G_2	G_1	G_0	
0	0	0	0	0	0	0	0	← 1-bit difference so it is unit dis. code.
0	0	0	1	0	0	0	1	
0	0	1	0	0	0	1	1	
0	0	1	1	0	0	1	0	

Circuit Diagram :-



(4-bit Binary to gray conversion)

- For n-bit binary to gray conversion the number of Ex-OR gate will be (n-1).
- Ex-OR follow Cyclic property.

e.g. $A \oplus B = C$

$1 \quad 0 \quad 1$

$B \oplus C = 1$

$0 \quad 1 = A$

$A \oplus C = 0$

$1 \quad 1 = B$

} So Ex-OR follow Cyclic property

Karnaugh Map / K-Map :-

It is also called as graphical representation of Boolean expression.

The disadvantage of Boolean Algebra (SOP & POS) is, it is applicable for 1 or 0 but K-map is applicable for 1 or 0 or X (d/ϕ) (don't care)

- K-map is applicable for 2-variable, 3-variable & 4-variable.

1. 2-Variable :-

A	B	
0	0	→ 0
0	1	→ 1
1	0	→ 2
1	1	→ 3

A \ B	0	1
0	0	1
1	2	3

2. 3-Variable :-

	A	B	C	
0	0	0	0	←
1	0	0	1	←
2	0	1	0	←
3	0	1	1	←
4	1	0	0	←
5	1	0	1	←
6	1	1	0	←
7	1	1	1	←

MSB, Ex-OR

A \ BC	00	01	10	11
0	0	1	3	2
1	4	5	7	6

3: 4-Variable :-

A B C D
0 0 0 0
⋮
1 1 1 1

AB \ CD	00	01	11	10
00	0	1	3	2
01	4	5	7	6
11	12	13	15	14
10	8	9	11	10

Grouping of K-Map :-

Maximum size of grouping in the k-map will have maximum priority.

- In case of grouping the relation used is 2^n. Where n represents integers.

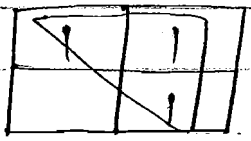
2^n $n = 0$, $2^0 = 1$ [individual] $\rightarrow min^m$

$n = 1$ $2^1 = 2$ [Pair]

$n = 2$ $2^2 = 4$ [Quad]

[Maximum priority] $n = 3$ $2^3 = 8$ [Oct]

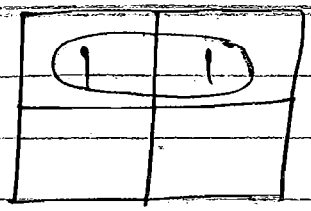
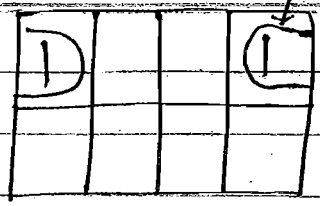
e.g. :-



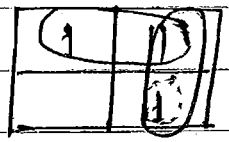
invalid.

* In case of k-map diagonal grouping is in-valid.

End grouping.

e.g :- ①  , ② 

End grouping is valid in k-map.

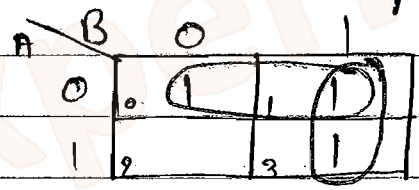
③ 

Note :-

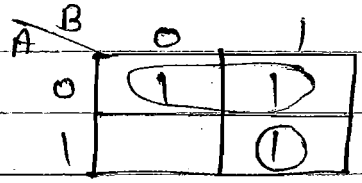
In the k-map grouping the used value can be used repeated no. of times provided is condition is that, the no. of groups should not exceed as compaired to previous.

Qus For the given function $f(A,B) = \sum m(0,1,3)$ find the minimise expression.

Sol^n



$Y = \bar{A} + B$



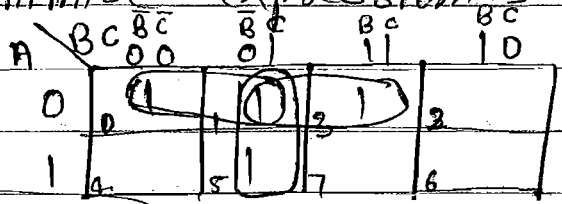
$\bar{A} + AB$

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

$Y = \bar{A} + B$

Qus For the given function $f(A,B,C) = \sum m(0,1,3,5)$ find the minimise expression.

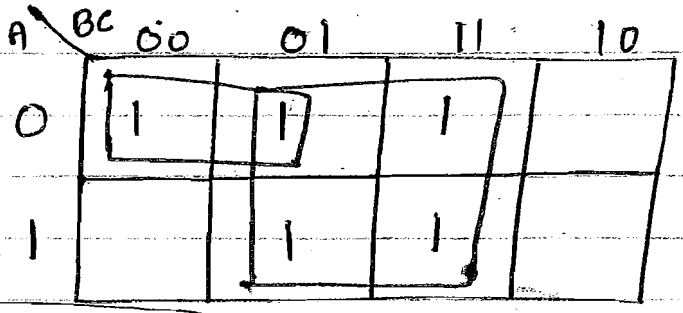
Sol^n



$Y = \bar{A}\bar{B} + \bar{B}C + \bar{A}C$

Ques for the given k-map find the output minimise expression.

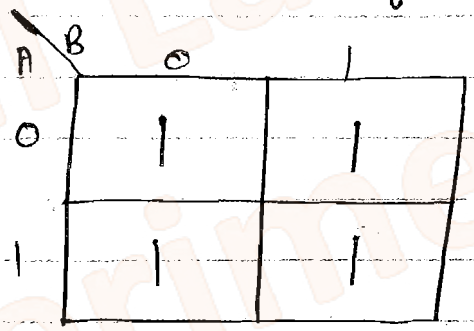
Soln



$Y = \bar{A}\bar{B} + C$

Ques for the given k-map find the o/p minimise expression.

Soln

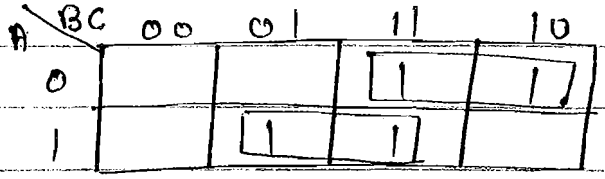


$f = 1$

If all boxes contains 1 then o/p = 1.
If all boxes contains 0 then o/p = 0
If all boxes contains X then o/p = X.

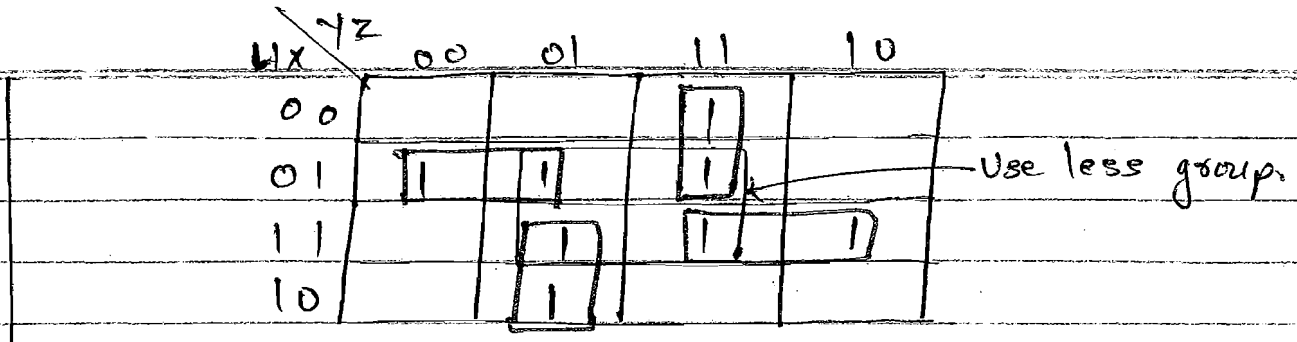
Ques for the given k-map find the o/p minimise expression.

Soln



$Y = \bar{A}B + AC$

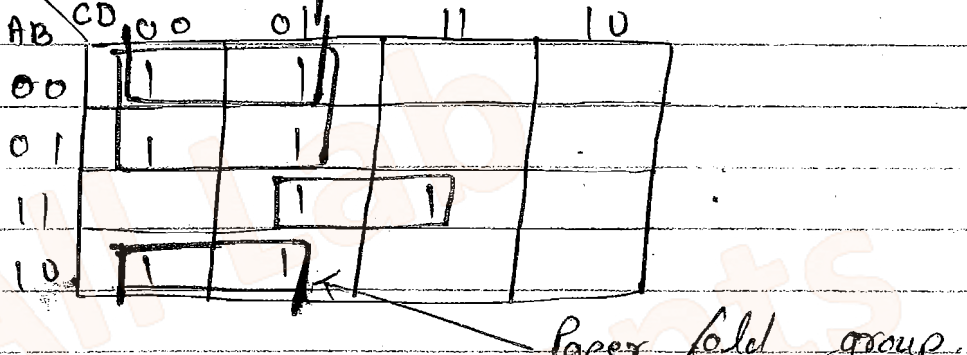
Ques for the given k-map find the minimise expression.



$$y = \bar{W}X\bar{Y} + W\bar{Y}Z + WX\bar{Y} + WXY$$

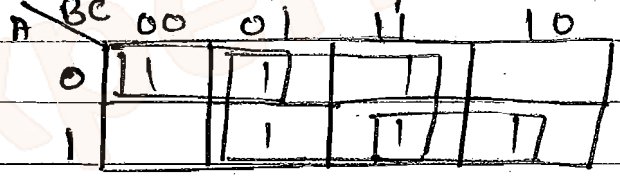
Ques Find the minimise expression

Sol^n



$$y = ABD + \bar{A}\bar{C} + \bar{B}\bar{C}$$

Ques Find the minimis expression.



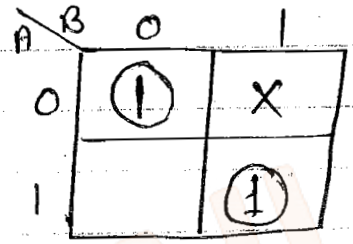
Sol^n

$$y = \bar{A}\bar{B} + C + AB$$

* Don't Care Condition :- [d, x, ϕ]

It is mainly used in counter design By using don't care the number of universal gate required reduces drastically.

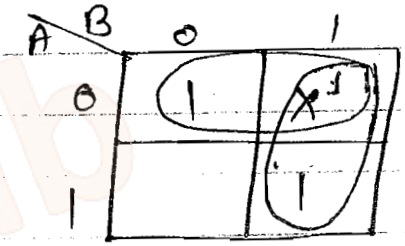
Don't care can be assumed as 1 or 0 bassed on the requirement.



$Y = \bar{A}\bar{B} + AB$

(Without don't care)

(max^n no. of gates required to construct)



$Y = \bar{A} + B$

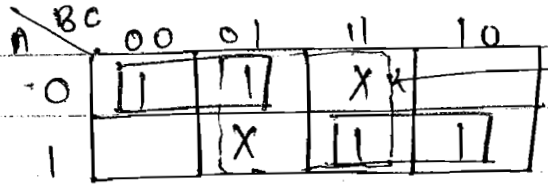
(With don't care)

(min^m no. of gates required to constru

AB	A ⊙ B	$\bar{A} + B$
0 0	1	1
0 1	0	1
1 0	0	0
1 1	1	1

Ques For the given K-map find the minimise expression.

Soln

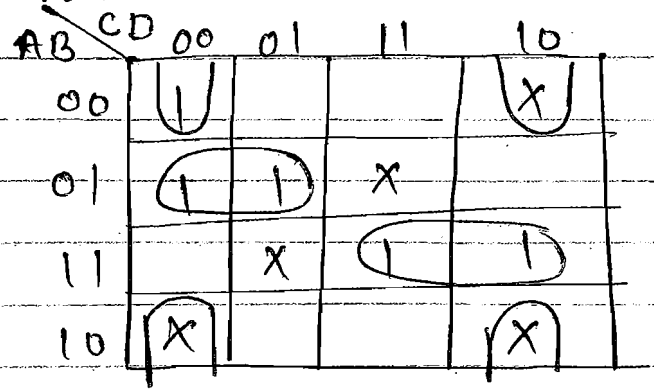


returned group.

$Y = \bar{A}\bar{B} + AB$

Ques For the given K-map find the minimise expression.

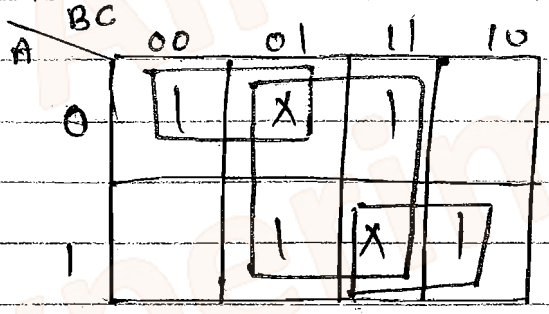
Sol^n



$$Y = \bar{A}B\bar{C} + ABC + B\bar{C}\bar{D}$$

Ques For the given K-map find the minimise expression.

Sol^n

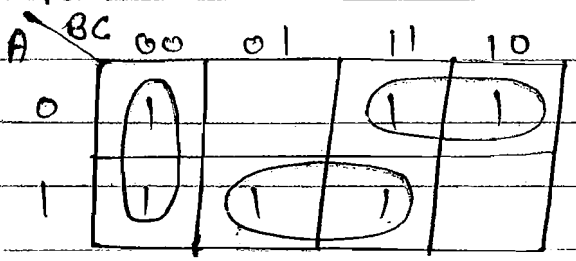


$$Y = C + \bar{A}\bar{B} + AB$$

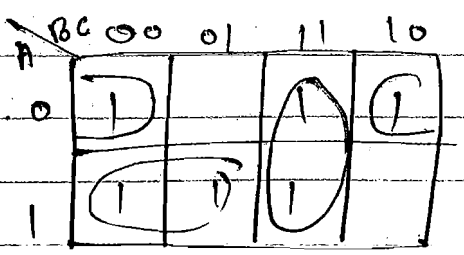
Ques For the given K-map find the minimise expression.

A B C
0 1 0

$Y_1 = 1$
$Y_2 = 1$



$$Y_1 = \bar{B}\bar{C} + AC + \bar{A}B$$



$$Y_2 = BC + \bar{A}\bar{C} + AB$$

*(i) Implicant

(ii) Prime Implicant

(iii) Essential prime Impliment

for those k-map which produces multiple type of answers.

1. Implicant :-

It represents number of minterms or no. of 1's present in the k-map.

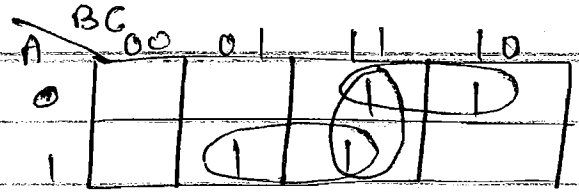
2. Prime Implicant :-

It is a product term formed by maximum possible grouping without failing priority. And also include retundent group.

3. Essential prime Impliment :-

It is the part of prime implicant but excluded retundent group or if a single k-map produce multiple type of answers then the final ans is compare, the no. of common terms present in the final answer represent Essential prime implicant.

Aus Find Implicant, Prime Implicant and Essential prime Implicant for a given k-map.

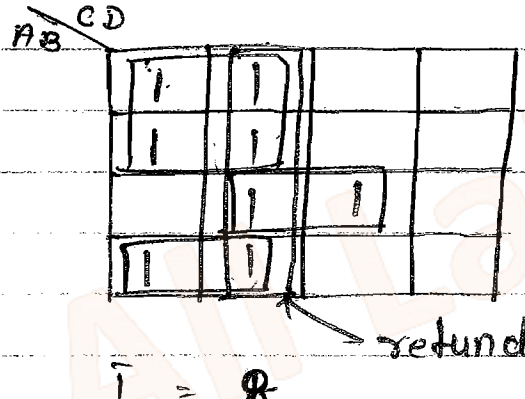


I = 4

P.I = 3

E.P.I = 2

(ii)



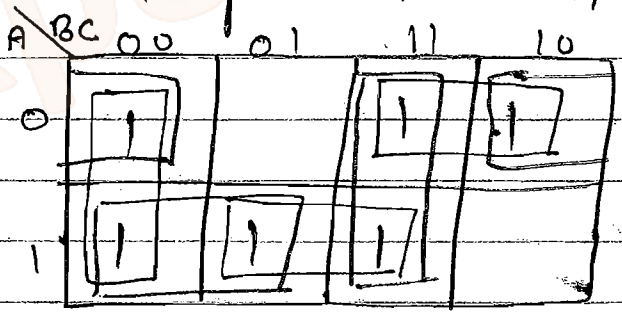
I = 8

P.I = 4

E.P.I = 3

Qus Find out the parameters I, PI, EPI.

Soln



I = 6

P.I = 6

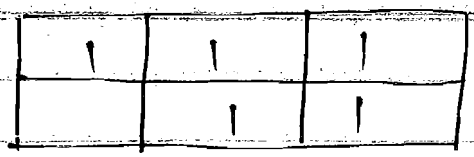
E.P.I = 0

$y_1 = \bar{B}\bar{C} + AC + \bar{A}B$

$y_2 = BC + \bar{A}\bar{C} + A\bar{B}$

∵ Here no common term in final ans.

Qus Find the parameteres I, PI, EPI.



$I = 5$

$PI = 2$

$EPI = 2$

Ques For the given function $f(A,B,C) = \pi M(2,4,6,7)$
$= \Sigma m(0,1,3,5)$
find the k-map

Ques $f(A,B,C,D) = \pi M(2,3,6,7,10,11,12,14)$
$= \Sigma m(0,1,4,5,8,9,13,15)$

Ques For the given k-map