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Group No. 1

UIDs:

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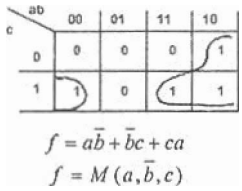
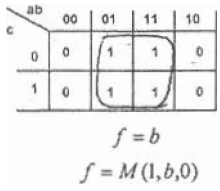
# Worksheet 9
# EEL 4705
## Emerging Logic Devices – K-Map based Mapping
(To convert AND/OR Logic to Majority Logic)



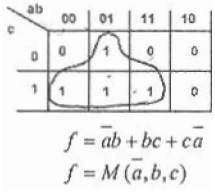

$f = a\bar{b} + \bar{b}c + ca$

$f = M(a,\bar{b},c)$



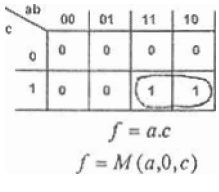

$f = b$

$f = M(1,b,0)$



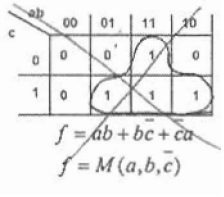

$f = \bar{a}b + bc + c\bar{a}$

$f = M(\bar{a},b,c)$




$f = a.c$

$f = M(a,0,c)$

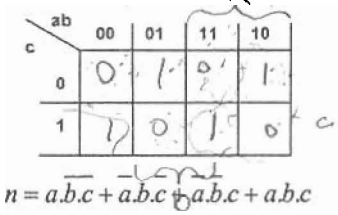



$f = \bar{a}b + b\bar{c} + \bar{c}a$

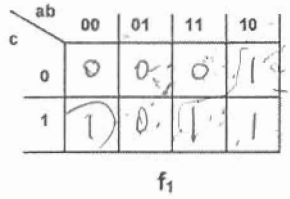
$f = M(a,b,\bar{c})$

**Question 1:** Making use of the Algorithm and the K-Maps depicted, reduce the following function into a Majority Logic function. Each of the three functions ($f_1$,$f_2$,$f_3$) will be only from the Library of K-Map patterns depicted above.

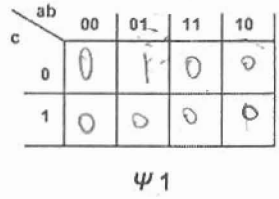
- $n = a.\bar{b}.\bar{c} + \bar{a}.b.\bar{c} + \bar{a}.\bar{b}.c + a.b.c$
- Function needs to be broken in the form n = Maj ($f_1$,$f_2$,$f_3$)
- Find an admissible pattern for $f_1$ from the above library.
  For finding $f_2$, set $\Psi_1$ is obtained as follows: if a minterm of n is not a minterm of $f_1$, add this minterm to $\Psi_1$.
  Similarly, for finding $f_2$, set $\Psi_0$ is obtained as follows: if a maxterm of n is not a maxterm of $f_1$, add this maxterm to $\Psi_0$.
- A suitable pattern for $f_2$ is then determined using new $\Psi_1$ and $\Psi_0$ (from the above library).
  Furthermore, to determine $f_3$, $\Psi_1$ and $\Psi_0$ are updated again as follows: if a minterm (maxterm) of node n is not a minterm (maxterm) of both f1 and f2, add this minterm (maxterm) to $\Psi_1$ ($\Psi_0$).



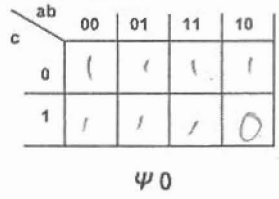

$n = a.\bar{b}.\bar{c} + \bar{a}.b.\bar{c} + \bar{a}.\bar{b}.c + a.b.c$



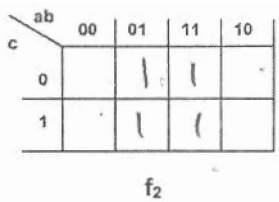

$f_1$



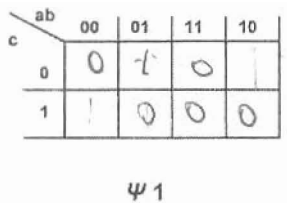

$\Psi 1$



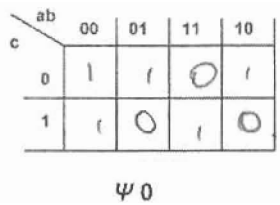

$\Psi 0$



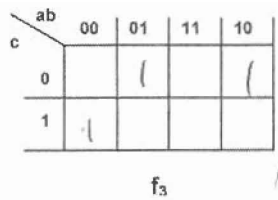

$f_2$



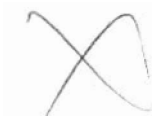

$\Psi 1$

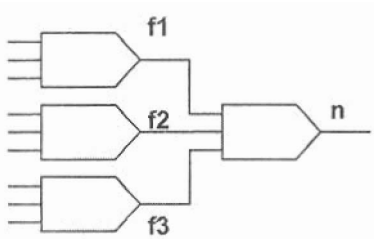



$\Psi 0$




$f_3$





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**Question 2:** Perform the AND/OR mapping of the same expression $n = a\bar{b}\bar{c} + \bar{a}b\bar{c} + \bar{a}\bar{b}c + abc$. Then see the difference in the number of majority gates used for K-map method and AND/OR method.