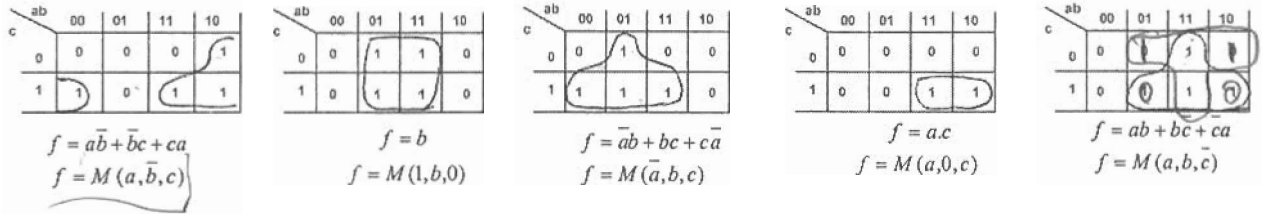


(A)

## Worksheet 9 EEL 4705

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

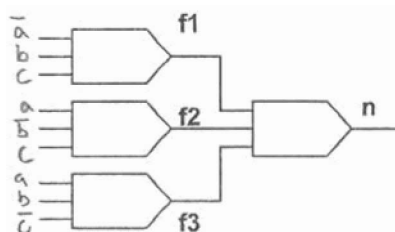
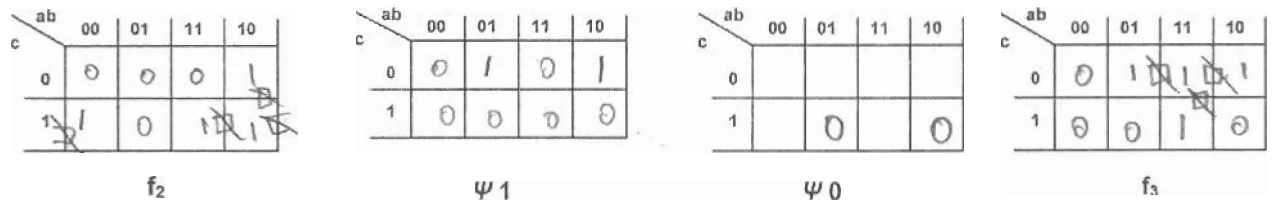
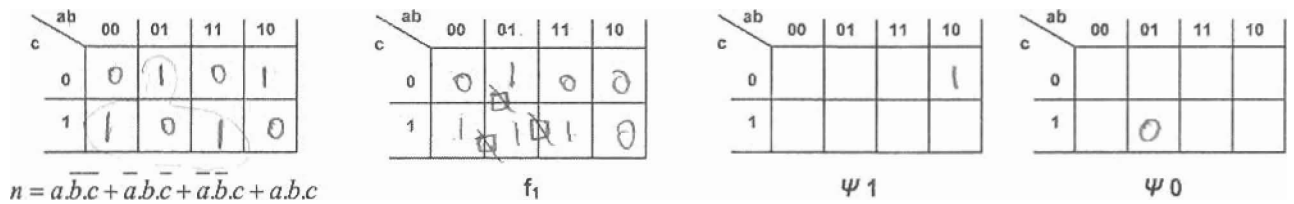


**Question 1:** Making use of the Algorithm and the K-Maps depicted, reduce the following function into a Majority Logic function. Each of the three functions ( $f_1, f_2, f_3$ ) will be only from the Library of K-Map patterns depicted above.

- $n = a\bar{b}\bar{c} + \bar{a}b\bar{c} + \bar{a}\bar{b}c + abc$   
Function needs to be broken in the form  $n = \text{Maj}(f_1, f_2, f_3)$   
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  $f_1$  and  $f_2$ , add this minterm (maxterm) to  $\Psi_1$  ( $\Psi_0$ ).



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

