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 \( f, f_1, f_2, f_3 \) will be only from the Library of K-Map patterns depicted above.

- \( n = a\overline{b}c + \overline{a} b \overline{c} + \overline{a} \overline{b}c + ab.c \)
  
  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 $n = \overline{a} \cdot b \cdot \overline{c} + a \cdot \overline{b} \cdot c + \overline{a} \cdot \overline{b} \cdot \overline{c} + a \cdot b \cdot c$

Then see the difference in the number of majority gates used for K-map method and AND/OR method.