Logic Simplification and Design

Consider the logical function:

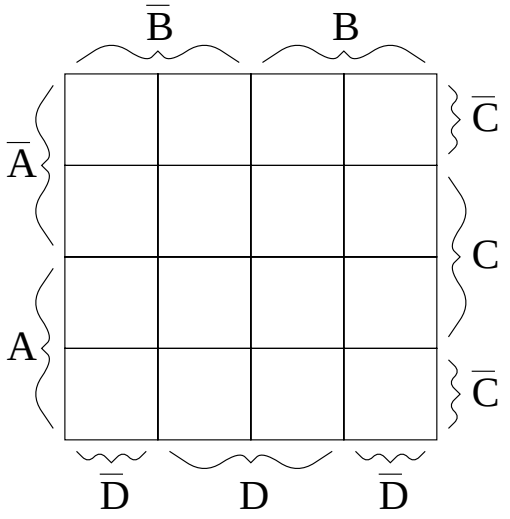
$$Out = (\overline{(\overline{A} + B)} + B)\,\overline{D} + \overline{(\overline{C} + B)(A + D)(\overline{B} + \overline{C} + \overline{D})}$$

Part A Implement the function using 2-input and 3-input NAND gates and inverters. Use a MIXED LOGIC design methodology. All bubbles must be paired; all bars must be bubbled.

Part B Use DeMorgan's Theorem to obtain an equivalent expression which contains ANDs and ORs of the inputs (e.g., A) and their complements (e.g., $\overline{A}$). There should be **no complements (bars)** in the final expression except those over the inputs. Do **not** simplify the expression for this part.

$Out =$

Part C Complete the Karnaugh map below and identify the prime implicants. Then write the simplified expression. Be sure the factor out any common terms in your solution.



prime implicant	essential?
	yes☐ no☐
	yes☐ no☐
	yes☐ no☐
	yes☐ no☐
	yes☐ no☐
	yes☐ no☐
	yes☐ no☐

$Out =$

Part D Now reimplement the simplified expression from part C using 2-input NAND gates and inverters. Use the MIXED LOGIC design methodology. All bubbles must be paired; all bars must be bubbled.