(I) (Laws and Theorems of Boolean Algebra) Prove using Boolean algebra that \(a'c' + ab + ac + a'b' = a'c' + ab + b'c\). Write the particular law you are using in each step.

(II) (Laws and Theorems of Boolean Algebra) Prove using Boolean algebra that 
\[(a + c)(a' + c')(b' + c + d')(a + b' + d') = (a + c)(a' + c')(b' + d').\] Write the particular law you are using in each step.

(III) (Karnaugh Map) Use Karnaugh map to simplify function 
\[f(a, b, c, d) = \sum m(0, 1, 2, 3, 4, 5, 7, 8, 12) + \sum d(10, 11).\] List all possible minimal two-level sum of products expressions. Show the switching functions. No need for the diagram.

(IV) (Karnaugh Map) Use Karnaugh map to simplify function 
\[f(a, b, c, d) = \sum m(0, 1, 2, 3, 4, 5, 7, 8, 12) + \sum d(10, 11).\] List all possible minimal two-level product of sums expressions. Show the switching functions. No need for the diagram.

(V) Universal Set of Gates: Check if the set in the following list is universal and explain your decision. Assuming constants 0 and 1 are available as inputs.

i. \{AND, NOT\}

ii. \{NAND\}

iii. \{XOR, NOT\}

iv. \{\(f(x, y)\), where \(f(x, y) = x'y\)\}

v. \{\(g(x, y, z)\), where \(g(x, y, z) = (x + y)z'\)\}

vi. \{\(f(x, y), g(x, y)\), where \(f(x, y) = x'y + xy'\) and \(g(x, y) = x'y'\)\}