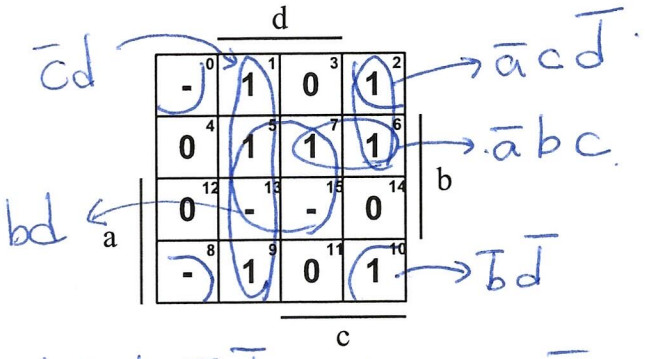
CS M51A/EE M16 Disc 1A - S'14 Quiz #2

1. (10 points)

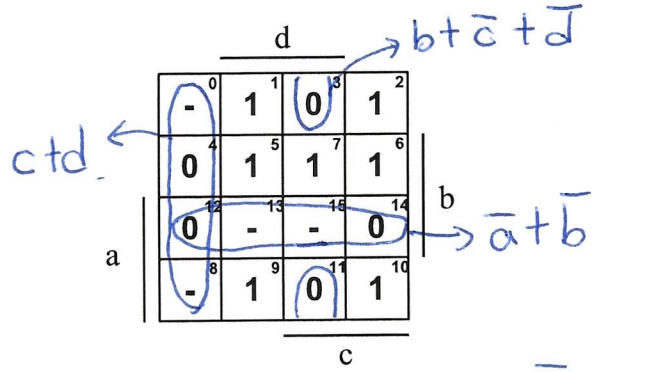
Part (a) (5 points) Given the incompletely specified function of four variables $f(a, b, c, d)$ represented by the K-map below, identify all prime implicants, and write the minimal "sum-of-products" (AND-OR) switching expression. Circle and identify every "product" terms of the minimal expression on the K-map. (Required!!!)



Prime implicants: $\bar{c}d, bd, b\bar{d}, \bar{a}bc, \bar{a}c\bar{d}$

The minimal expression $f(a, b, c, d) =$ $\bar{c}d + b\bar{d} + \bar{a}bc$

Part (b) (5 points) Repeat Part (a), but this time identify all essential prime implicates and write the minimal "product-of-sum" (OR-AND) switching expression. Circle and identify every "sum" terms of the minimal expression on the K-map. (Required!!!)

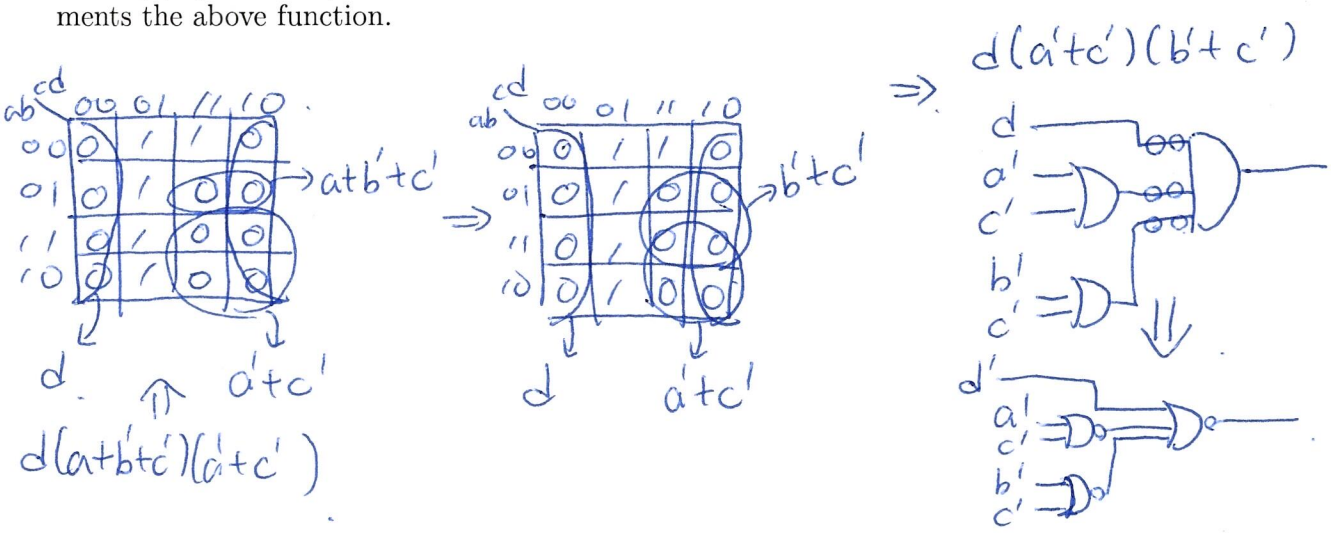


Essential prime implicates: $c + d, \bar{a} + \bar{b}, b + \bar{c} + \bar{d}$

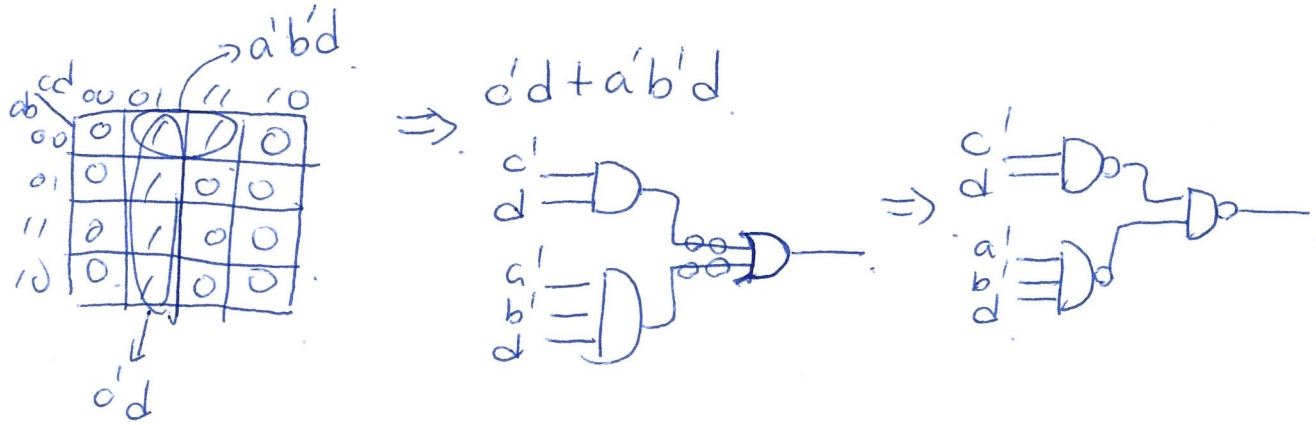
The minimal expression $f(a, b, c, d) =$ $(c + d)(\bar{a} + \bar{b})(b + \bar{c} + \bar{d})$

2. (10 points) Given the switching function: $f(a,b,c,d) = d(a + b' + c')(a' + c')$, and assuming that both complemented and uncomplemented variables are available, answer the questions in Parts (a) and (b).

Part (a) (5 points) Draw a **minimal two-level NOR-NOR** gate network that implements the above function.



Part (b) (5 points) Draw a **minimal two-level NAND-NAND** gate network that implements the above function (Show all your work below for full credit).



End of Quiz #2