Logic design (2017 fall)
Quiz # 3

Name:_____ID:_____

1. (60%) Simplify each of the following expressions to the minimum sum of product.

   (a) KLM + K'N + L'N + MN

   (The minimum SOP contains total 7 literals)

   (b) (K' + L + M' + N)(K' + M' + N + R)(K' + M' + N + R')KM

   (The minimum SOP contains total 3 literals)

   (a) KLM + K'N + L'N + MN

   = KLM + (K' + L')N + MN

   = KLM + (KL)'N + MN (Consensus Theorem)

   = KLM + K'N + L'N

   (b) (K' + L + M' + N) (K' + M' + N + R) (K' + M' + N + R') KM

   = [K' + M' + (L + N) (N + R) (N + R')] KM {Distributive Law twice with X = K' + M'}

   = [K' + M' + (L + N)N] KM

   = [K' + M' + N] KM = KMN

2. (40%) Determine whether the following equation is always valid or not with algebraic proof

$$(x \equiv y \equiv xy) = (x + y)$$

LHS : $x \equiv y \equiv xy$

$= (xy + x'y') \equiv xy$

$= (xy + x'y')xy + (xy + x'y')'(xy)'$

$= xy + (xy' + x'y)(x' + y')$

$= xy + x'y + xy'$

$= x + y$ => RHS