Name: KEY **Id#**

COE 202, Term 132
Digital Logic Design

Quiz# 2

Date: Tuesday, Feb. 25

Q1. Prove the identity of each of the following Boolean functions using algebraic manipulation. Start with the left-hand side expression and derive from it the right-hand side expression.

i. $\bar{a}\,\bar{c} + a\,d + b\,\bar{c}\,d = \bar{a}\,\bar{c} + a\,d$

A`C` + A D + B C` D = A`C` + A D + B C` D + C` D (by consensus between A`C` + A D)
= A`C` + A D + C` D (by absorption of B C` D in C` D)
= A`C` + A D (by consensus between A`C` + A D)

Another Solution:
A`C` + A D + B C` D = A`C` + A D + B C` D (A + A`)
= A`C` + A D + A B C` D + A` B C` D
= A`C` + A D (by absorption of A B C` D in AD and absorption of A` B C` D in A` C`)

ii. $\overline{(\bar{a}\,[\bar{c} + d] + c\,[\bar{b} + \bar{d}\,] + \bar{c}\,\bar{d}\,)} = a\,d\,(b + \bar{c})$

= (a + c d`) (c` + b d) (c +d) (by Demogan's Law)
= (a c` + a b d) (c + d) (by distributive law)
= (a c` d + a b c d + a b d) (by distributive law)
= a c` d + a b d (by absorption of a b c d in a b d)
= a d (c` + b) (by distributive law)

Q2. Given the Boolean functions $F(A,B,C) = \sum m(0,2,4,7)$ and $G(A,B,C) = \prod M(0,3,5,6)$.

i. Give the *algebraic* sum of minterms expression for *F*.

$$F = \bar{A}\,\bar{B}\,\bar{C} + \bar{A}\,B\,\bar{C} + A\,\bar{B}\,\bar{C} + A\,B\,C$$

ii. Express the function *G* as a sum of minterms, $G = \sum m(\dots)$

$$G = \sum m(1,2,4,7)$$

iii. Express the function *F.G* as a sum of minterms, $F.G = \sum m(\dots)$

$$F.G = \sum m(2,4,7)$$

iv. Express the function *F+G* as a product of maxterms, $\boldsymbol{F + G = \prod M(\dots)}$

$$F + G = \sum m(0,1,2,4,7) = \prod M(3,5,6)$$