

Name: KEY

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COE 202, Term 151  
Digital Logic Design

Quiz# 2

Date: Thursday, Sep. 17

**Q1** Use Boolean algebra to simplify the following equations into the given number of literals in sum-of-product form. Show clearly all your steps.

a. Reduce  $AB + A'C + BC' + B'C$  to 2 literals

$$\begin{aligned} &= AB + A'C + BC + BC' + B'C \quad [\text{by consensus between } AB \text{ and } A'C] \\ &= AB + A'C + B[C + C'] + B'C \quad [\text{by distributive law}] \\ &= AB + A'C + B + B'C \\ &= A'C + B + B'C \quad [\text{by absorption}] \\ &= A'C + (B + B')(B + C) \quad [\text{by distributive law}] \\ &= A'C + B + C \\ &= B + C \quad [\text{by absorption}] \end{aligned}$$

b. Reduce  $[A + BC]' + B$  to 2 literals

$$\begin{aligned} &= A' \cdot (B' + C') + B \quad [\text{by Demorgan's law}] \\ &= A'B' + A'C' + B \quad [\text{by distributive law}] \\ &= (A' + B)(B' + B) + A'C' \quad [\text{by distributive law}] \\ &= A' + B + A'C' \\ &= A' + B \quad [\text{by absorption}] \end{aligned}$$

**Q2.** Given the Boolean function  $F(X, Y, Z) = (X + Y)(\bar{X}\bar{Y} + XZ)$ :

a. Express F as a **product-of-Maxterms**,  $F = \prod M$ .

$$F = XZ + X\bar{Y}Z = XZ = \sum m(5, 7) = \prod M(0, 1, 2, 3, 4, 6)$$

b. Find the **algebraic sum-of-minterms** expression for F.

$$F = \sum m(5, 7) = X\bar{Y}Z + XYZ$$