Examples – Circuits and Electronics

Week 1

Q.1 Reduce the following Boolean expressions to the required number of literals.

(a) $A B C + \overline{A} \overline{B} C + \overline{A} BC + A B\overline{C} + \overline{A} \overline{B} \overline{C}$ to five literals

(b) $\overline{[(\overline{CD}) + A]} + A + CD + AB$ to three literals

(c) $(A + C + D)(A + C + \overline{D})(A + \overline{C} + D)(A + \overline{B})$ to four literals.

Q.2 For each of the problems in Q.1, draw up a truth table and show that the simplified expressions are equivalent to the original Boolean expressions.

Q.3 For each of the problems in Q.1, draw a logic circuit implementation of the simplified expressions using AND, OR and NOT gates.

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Q.4 Use Karnaugh maps to simplify the following Boolean function in:
   (a) Sum-of-products, and
   (b) Product-of-sums form.

   $F = \overline{W} (\overline{X} Y + \overline{X}\overline{Y} + X Y Z) + X\overline{Z} (Y + W)$

   $\text{"don't care"} = \overline{W} X (\overline{Y} Z + Y \overline{Z}) + W Y Z$