./ 4-1. Simplify the following expressions using Boolean algebra.

(a) $x = ABC + \overline{A}C$

4-1

(b) $y = (Q + R)(\overline{Q} + \overline{R})$

4-1

(c) $w = ABC + A\overline{B}C + \overline{A}$

4-1

(d) $q = \overline{RST}\,(\overline{R + S + T})$

4-1

(e) $x = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}BC + ABC + A\overline{B}\,\overline{C} + A\overline{B}C$

4-1

(f) $z = (B + \overline{C})(\overline{B} + C) + \overline{\overline{A} + B + \overline{C}}$

4-1

(g) $y = \overline{(C + D)} + \overline{A}C\overline{D} + A\overline{B}\,\overline{C} + \overline{A}\,\overline{B}CD + AC\overline{D}$

4-1

(h) $x = AB(\overline{\overline{C}D}) + \overline{A}BD + \overline{B}\,\overline{C}\,\overline{D}$

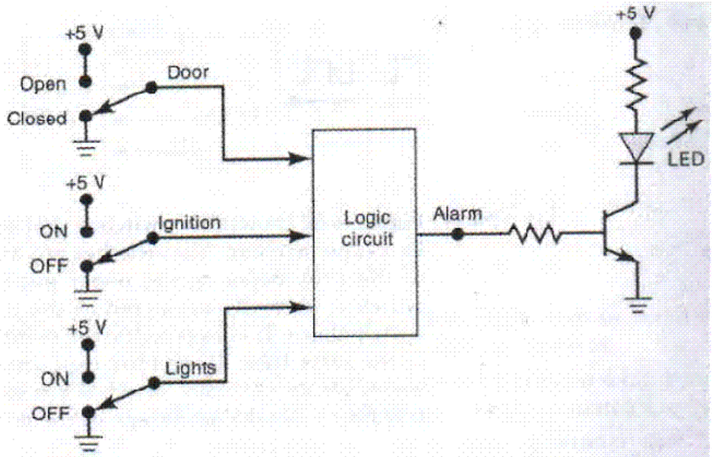
SECTION 4-4

4-4. Design the logic circuit corresponding to the truth table shown in Table 4-9.

A	B	C	x
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

4-8. Figure 4-63 shows a diagram for an automobile alarm circuit used to detect certain undesirable conditions. The three switches are used to indicate the status of the door by the driver's seat, the ignition, and the headlights, respectively. Design the logic circuit with these three switches as inputs so that the alarm will be activated whenever either of the following conditions exists:

- The headlights are on while the ignition is off.
- The door is open while the ignition is on.



4-9. Implement the circuit of Problem 4-4 using all NAND gates.

A	B	C	x
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	1

3 4-11. Determine the minimum expression for each K map in Figure 4-64. Pay particular attention to step 5 for the map in (a).

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1	1	1	1
$\bar{A}B$	1	1	0	0
AB	0	0	0	1
$A\bar{B}$	0	0	1	1

(a)

4-11. Determine the minimum expression for

	$\overline{C}\,\overline{D}$	$\overline{C}D$	CD	$C\overline{D}$
$\overline{A}\,\overline{B}$	1	0	1	1
$\overline{A}B$	1	0	0	1
AB	0	0	0	0
$A\overline{B}$	1	0	1	1

(b)

4-11. Determine the minimum expression for

	$\overline{C}$	C
$\overline{A}\,\overline{B}$	0	1
$\overline{A}B$	0	0
AB	1	0
$A\overline{B}$	1	X

(c)

4-12. Simplify the expression in Problem 4-1(e) using a K map.

(e) $x = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}BC + ABC + A\overline{B}\,\overline{C} + A\overline{B}C$

4-13. Simplify the expression in Problem 4-1(g) using a K map.

(g) $y = \overline{(C + D)} + \overline{A}C\overline{D} + A\overline{B}\,\overline{C} + \overline{A}\,\overline{B}CD + AC\overline{D}$