P 7.33

(a) $F = AB + (\overline{C} + A)\overline{D} = \overline{(\overline{A} + \overline{B})(C\overline{A} + D)}$

(b) $F = A(\overline{B} + C) + D = \overline{(\overline{A} + B\overline{C})\overline{D}}$

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

(d) $F = (A + B + C)(A + \overline{B} + C)(\overline{A} + B + \overline{C}) = \overline{\overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}C}$

(e) $F = ABC + A\overline{B}C + \overline{A}B\overline{C} = \overline{(\overline{A} + \overline{B} + \overline{C})(\overline{A} + B + \overline{C})(A + \overline{B} + C)}$

P 7.43

$I = \overline{A}BC + AB\overline{C} + ABC = \sum m(3, 6, 7)$

$I = (A + B + C)(A + B + \overline{C})(A + \overline{B} + C)(\overline{A} + B + C)(\overline{A} + B + \overline{C}) = \prod M(0, 1, 2, 4, 5)$

P 7.44

$J = \overline{A}\overline{B}C + \overline{A}BC + A\overline{B}C + AB\overline{C} + ABC = \sum m(1, 3, 5, 6, 7)$
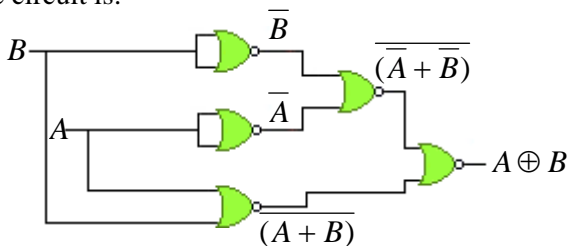
$J = (A + B + C)(A + \overline{B} + C)(\overline{A} + B + C) = \prod M(0, 2, 4)$

P 7.50

The truth table is as shown in the right, thus the product of sum expression is:

$A \oplus B = (A + B)(\overline{A} + \overline{B}) = \overline{\overline{(A + B)} + \overline{(\overline{A} + \overline{B})}}$

The circuit is:

A	B	$A \oplus B$
0	0	0
0	1	1
1	0	1
1	1	0

P 7.81

Q₀	Q₁	Q₂
1	0	0
0	1	0
1	0	1
1	1	0
1	1	1
0	1	1
0	0	1

repeats

The register returns to the initial state after seven shifts.

P 7.82

(a) With an OR gate, after the register reaches the 111 state, it remains in that state and never returns to the starting state.

Q₀	Q₁	Q₂
1	0	0
0	1	0
1	0	1
1	1	0
1	1	1
1	1	1

(b) With an AND gate, after the register reaches the 000 state, it remains in that state and never returns to the starting state.

Q₀	Q₁	Q₂
1	0	0
0	1	0
0	0	1
0	0	0
0	0	0

P 7.83

The period of the Q_0 waveform is double that of V_{in} , and the period of Q_1 is twice that of Q_0. Thus flip flops connected in this manner divide the frequency of an input signal by two and by four.