

Karnaugh Map Method

Example 1: Simplify $F = \sum(1,3,7,5)$ by using karnaugh maps

$$\begin{aligned}
 F &= \overline{A}\overline{B}C + \overline{A}BC + ABC + A\overline{B}C \\
 &= \overline{A}C(\overline{B} + B) + AC(B + \overline{B}) \\
 &= \overline{A}C + AC \\
 &= C(\overline{A} + A) = C
 \end{aligned}$$

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

$X = C$

Example 2: Simplify $F = \sum(3,2,8,10)$ by using karnaugh maps

Solution

$$\begin{aligned}
 F &= \overline{A}\overline{B}CD + \overline{A}B\overline{C}\overline{D} + A\overline{B}C\overline{D} + A\overline{B}C\overline{D} \\
 &= \overline{A}\overline{B}C + A\overline{B}\overline{D}
 \end{aligned}$$

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

Example 3: Simplify $F = \sum(12, 8, 14, 10)$ by using Karnuagh maps

$ABC\bar{D}$, $\bar{A}BC\bar{D}$, $ABCD\bar{D}$, and $\bar{A}BC\bar{D}$.

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

$X = A\bar{D}$

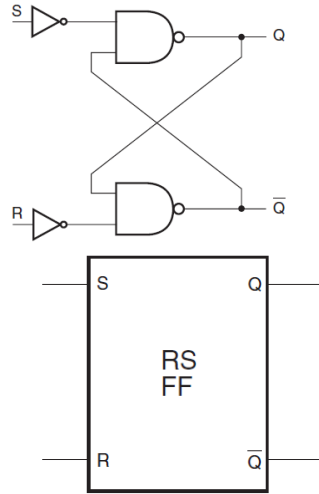
H.W

1- Simplify $F = \sum(12,13,15,14)$ by using karnuagh maps.

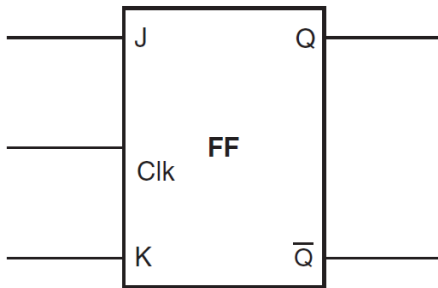
R-S Flip-Flop

R-S Flip-Flop with Active High Inputs

Operation Mode	S	R	Q_{n+1}
No change	0	0	Q_n
SET	1	0	1
RESET	0	1	0
Forbidden	1	1	—



J-K Flip Flop



Operation Mode	J	K	Clk	Q_{n+1}
SET	1	0	1	1
RESET	0	1	1	0
NO CHANGE	0	0	1	Q_n
TOGGLE	1	1	1	$\overline{Q_n}$

J-K flip-flop active High inputs.

- 1- J-K in Flip Flop
- 2- J-K close similar to R-S
- 3- J-K لا يوجد بها (نوت فالد)