

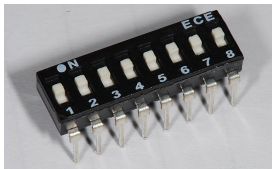
# Побитови операции

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Структури от данни и програмиране, спец. Компютърни науки, 2 поток, 2024/25 г.

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# Логически битови операции

Конюнкция

$\&$	0	1
0	0	0
1	0	1

Дизюнкция

$ $	0	1
0	0	1
1	1	1

Исключващо или

$\wedge$	0	1
0	0	1
1	1	0

Отрицание

$\sim$	
0	1
1	0

# Побитови операции

$$\begin{array}{r}
 \& \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0
 \end{array}$$

$$\begin{array}{r}
 | \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 1
 \end{array}$$

$$\begin{array}{r}
 ^\wedge \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1
 \end{array}$$

$$\begin{array}{r}
 \sim \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \hline
 \quad 1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1
 \end{array}$$

# Побитови операции

$$\begin{array}{r}
 \& \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0
 \end{array}$$

$$\begin{array}{r}
 | \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 1
 \end{array}$$

$$\begin{array}{r}
 \wedge \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \wedge \quad 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \\
 \quad 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \\
 \hline
 \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0
 \end{array}$$

$$\begin{array}{r}
 \sim \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \\
 \sim \quad 1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \\
 \hline
 \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0
 \end{array}$$

## Побитово изместване

>>2	1	0	1	0	1	1	0	1
<hr/>								
	0	0	1	0	1	0	1	1

$$a \gg x \longleftrightarrow a / 2^x$$

<<2	1	0	1	0	1	1	0	1
<hr/>								
	1	0	1	1	0	1	0	0

$$a \ll x \longleftrightarrow a * 2^x \% 2^8$$

# Маски

## Записване на битове

$$\begin{array}{r}
 \& \begin{array}{ccccccc} 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 & 1 & 0 & 1 & 1 \end{array} \\
 \hline
 \begin{array}{ccccccc} 0 & 0 & 1 & 0 & 1 & 0 & 1 & 0 \end{array}
 \end{array}
 \qquad
 \begin{array}{r}
 \begin{array}{ccccccc} 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{array} \\
 \hline
 \begin{array}{ccccccc} 0 & 0 & 1 & 1 & 1 & 1 & 1 & 0 \end{array}
 \end{array}$$

## Прочитане на битове

$$\begin{array}{r}
 \& \begin{array}{ccccccc} 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{array} \\
 \hline
 \begin{array}{ccccccc} 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \end{array}
 \end{array}
 \qquad
 \begin{array}{r}
 \& \begin{array}{ccccccc} 0 & 0 & 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \end{array} \\
 \hline
 \begin{array}{ccccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{array}
 \end{array}$$

# Операции с маски

## Конструирание на маски

$$\begin{array}{r}
 \ll 3 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \\
 \hline
 \quad \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0
 \end{array}$$

$$\begin{array}{r}
 \ll 3 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \\
 \hline
 -1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \\
 \hline
 \quad \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1
 \end{array}$$

# Операции с маски

## Конструиране на маски

<<3	0	0	0	0	0	0	0	0	1
~	0	0	0	0	1	0	0	0	
	1	1	1	1	0	1	1	1	

<<3	0	0	0	0	0	0	0	0	1
-1	0	0	0	0	1	0	0	0	
~	0	0	0	0	0	1	1	1	
	1	1	1	1	1	0	0	0	



# Операции с маски

## Конструирание на маски

$$\begin{array}{r}
 \ll 3 \quad 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \\
 \sim \quad 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \\
 \hline
 \quad \quad 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1
 \end{array}$$

$$\begin{array}{r}
 \ll 3 \quad 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \\
 -1 \quad 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \\
 \sim \quad 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 1 \\
 \hline
 \quad \quad 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 0 \ 0
 \end{array}$$

## Комбиниране на маски

$$\begin{array}{r}
 | \quad 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \\
 \quad 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \\
 \hline
 \quad 0 \ 0 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0
 \end{array}$$

$$\begin{array}{r}
 \& \quad 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 1 \\
 \quad 1 \ 1 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \\
 \hline
 \quad 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1
 \end{array}$$