

### Relational operations

< <= > >= == !=

### Ternary operation

```
if (s)
    f = a ; f = (s) ? a : b
else
    f = b ;
```

Figure 1.17: Relational operations

## 1.14 Bitwise operations

### 1.14.1 Basic Bitwise operations

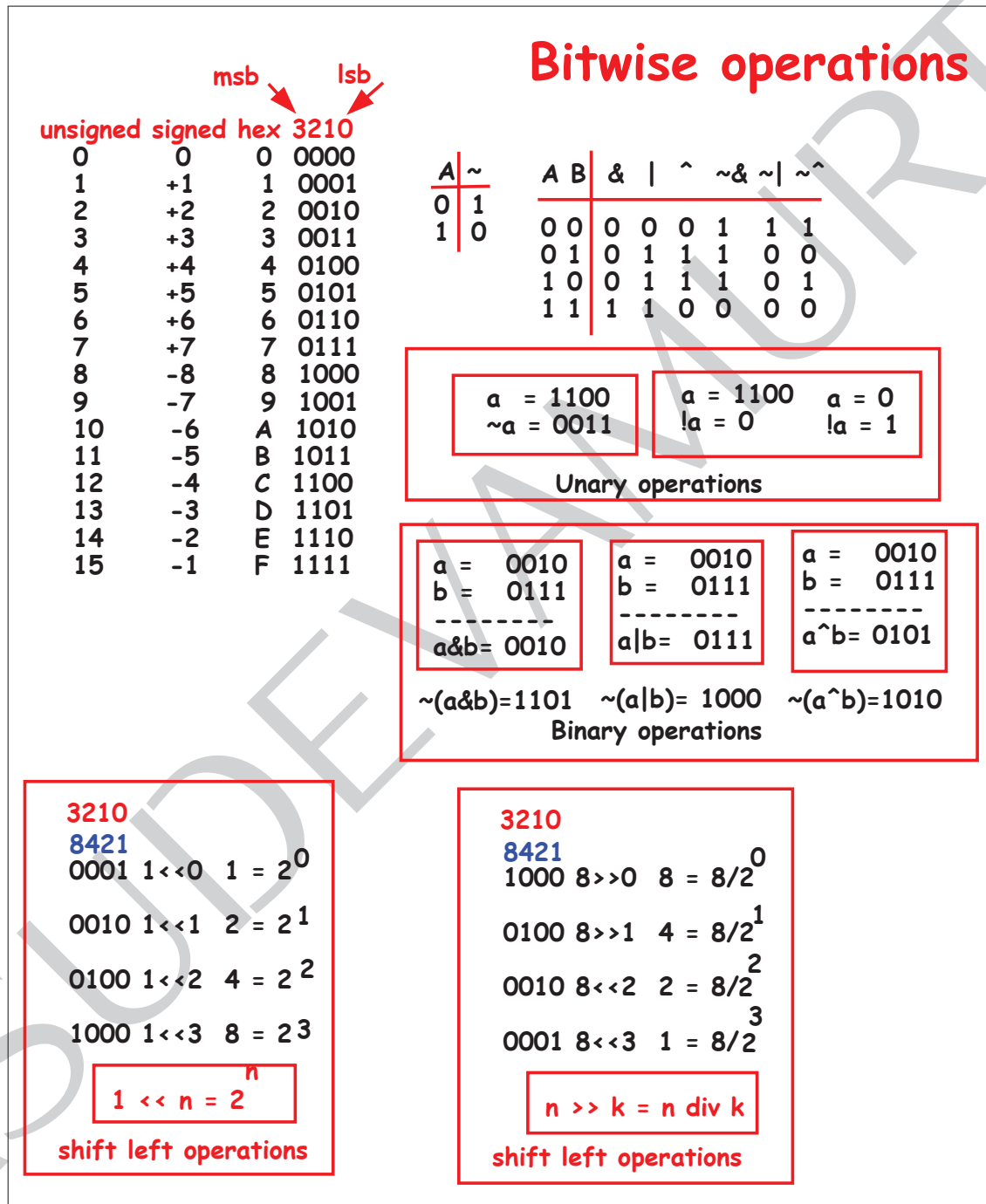


Figure 1.19: Bitwise operations

## 1.14. BITWISE OPERATIONS

### 1.14.2 Famous interview questions

**set\_bit\_i\_to\_1\_and\_all\_others\_to\_zero**  
ex: set bit 2 to 1  
(1 << 2) shift 1 left by 2  
3210  
0100

**set\_bit\_i\_to\_0\_and\_all\_others\_to\_one**  
ex: set bit 2 to 0  
3210  
0100 (set bit 2 to 1)  
1011 (1's complement)

**get\_bit\_i**  
3210  
n = 1010

n[1]	1	n[2]	2
n =	1010	n =	1010
mask =	0010	mask =	0100
=====		=====	
n & mask	0010 ans	n & mask	0000 ans
if (ans != 0) bit i = 1		if (ans == 0) bit i = 0	

**set\_bit\_i**  
3210  
n = 1010

n[2]	= 1	n[1]	= 1
n =	1010	n =	1010
mask =	0100	mask =	0010
-----		-----	
n   mask	= 1110	n   mask	= 1010

**reset\_bit\_i**  
3210  
n = 1010

n[1]	= 1	n[2]	= 0
n =	1010	n =	1010
mask =	1101	mask =	1011
-----		-----	
n & mask	= 1000	n & mask	= 1010

**reset\_last\_set\_bit\_of\_rightmost\_n**  
2  
n = 0010  
we want n = 0000

1  
n = 0111  
we want n = 0110

n =	0010 (2)	n =	0111 (7)
n-1 =	0001 (1)	n-1 =	0110 (6)
-----		-----	
n & n-1	= 0000	n & n-1	= 0110

Figure 1.20: Bitwise operations interview questions

Check if n is power of 2

Note exact 1

1	00001	$2^0$	$\log_2 1 = 0$
2	00010	$2^1$	$\log_2 2 = 1$
4	00100	$2^2$	$\log_2 4 = 2$
8	01000	$2^3$	$\log_2 8 = 3$
16	10000	$2^4$	$\log_2 16 = 4$

$n \&\& ((n \& n-1) == 0)$

2: 0010	4: 0100	6: 0110
1: 0001	3: 0011	5: 0101
-----		
&: 0000	&: 0000	&: 0100
2 = $2^1$	4 = $2^2$	6 is not power of 2

IDEA: if n is power of 2, the number of bit of n is exactly 1

Exact 1  
One Hot

0:	0000
1:	0001
2:	0010
3:	0011
4:	0100
5:	0101
6:	0110
7:	0111
8:	1000
9:	1001
10:	1010
11:	1011
12:	1100
13:	1101
14:	1110
15:	1111

Check if n is power of 4

Note exact 1

1	0000 0000 0000 0100	$2^2$
4 = 4	0000 0000 0001 0000	$2^4$
16 = 16	0000 0000 0011 0000	$2^6$
64 = 64	0000 0000 0100 0000	$2^8$
256 = 256	0000 0001 0000 0000	$2^{10}$
1024 = 1024	0000 0100 0000 0000	$2^{12}$
4096 = 4096	0001 0000 0000 0000	$2^{14}$
16384 = 16384	0100 0000 0000 0000	$2^{16}$

we need to put 0 at 2,4,6,8, 10, 12, 14 etc and all to 1 except at LSB(0)

IDEA MASK 1010 1010 1010 1010

8\*4 = 32 bits

4	0000 0000 0000 0100
OXAAAAA	1010 1010 1010 1010
&	0000 0000 0000 0000
256	0000 0000 0001 0000
OXAAAAA	1010 1010 1010 1010
&	0000 0000 0000 0000
13	0000 0000 0000 1101
OXAAAAA	1010 1010 1010 1010
&	0000 0000 0000 1000
255	0000 0001 0001 1111
OXAAAAA	1010 1010 1010 1010
&	0000 0000 0000 1010

$n \&\& ((n \& 0XAAAAAAAA) == 0)$

Figure 1.21: Bitwise operations interview questions

## 1.14. BITWISE OPERATIONS

**position\_of\_rightmost\_set\_bit**

**43210**

1	00001	$2^0$	$\log_2 1 = 0$
2	00010	$2^1$	$\log_2 2 = 1$
4	00100	$2^2$	$\log_2 4 = 2$
8	01000	$2^3$	$\log_2 8 = 3$
16	10000	$2^4$	$\log_2 16 = 4$

**IDEA**

**43210**

n = 18    10010

Convert n to this idea

Position of right most bit = 1

IDEA: get 00010

17	10001
~17	01110
18	10010
~17	01110
-----	
&	00010 (decimal 2)
	$\log_2 2 = 1$

**43210**

EX 2: n = 16    10000

Convert n to this idea

Position of right most bit = 4

15	01111
~15	10000
16	10000
~15	10000
-----	
&	10000 (decimal 16)
	$\log_2 16 = 4$

Figure 1.22: Bitwise operations interview questions