# Curs 1

## Conversie prin împărțiri succesive

*5(10)=?(2) =101(2)*

*5/2=2 rest 1*

*2/2=1 rest 0*

*1/2=0 rest 1*

## Conversie prin înmulțiri succesive

*0,3(10)=?(2) =0,0(1001)(2)*

*0,3\*2=0,6*

*0,6\*2=1,2*

*0,2\*2=0,4*

*0,4\*2=0,8*

*0,8\*2=1,6*

*0,6\*2*

## Logica din spatele metodei de conversie rapidă

*an* *an*-1 … *a2k* *a2k*-1 … *ak+2* *ak+*1 *ak* *ak*-1 … *a*1 *a*0, *a-1* *a*-2 … *a*1-k *a*-k *a-k-1* *a-k*-2 … *a1*-2k *a*-2k… *a-m* (*p*)=

*an\*pn+* *an*-1*\*pn-1+* … *a2k* *\*p2k+* *a2k*-1*\*p2k-1+* … *ak+2* *\*pk+2+* *ak+*1*\*pk+1+* *ak* *\*pk+* *ak*-1*\*pk-1+* … *a*1*\*p1+* *a*0*\*p0+*

*a-1* *\*p-1+* *a*-2*\*p-2+* … *a*1-k*\*p1-k+* *a*-k *\*p-k+* *a-k-1* *\*p-k-1+* *a-k*-2*\*p-k-2+* … *a1*-2k*\*p1-2k+* *a*-2k*\*p-2k+* … *a-m\*p-m*=

*an\*pn+* *an*-1*\*pn-1+* … *a2k* *\*p0)\*p2k+* (*a2k*-1*\*pk-1+* … *ak+2* *\*p2+* *ak+*1*\*p1+* *ak* *\*p0*)*\*pk+* (*ak*-1*\*pk-1+* … *a*1*\*p1+* *a*0*\*p0*)*\*p0+*

*(a-1* *\*pk-1+* *a*-2*\*pk-2+* … *a*1-k*\*p1+* *a*-k *\*p0*)*\*p-k+* (*a-k-1* *\*pk-1+* *a-k*-2*\*pk-2+* … *a1*-2k*\*p1+* *a*-2k*\*p0)\*p-2k+(* … *a-m\*p-m*

*0101 0001 0101 0010,1011 0010 1000*(2)*=5152,B28(16)*

*Andreica Amos are activitate de curs1*

# Curs2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| M | | | | C | A | | | | Q | | | |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | i=1 | =1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | -> |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  | i=2 | =0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | -> |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | i=3 | =1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | -> |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | i=4 | =1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | -> |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Andrei Sorin Terec

8

x=23(10)=17(16)=00010111(2)

y= - 17(10)= - 11(16)= - 00010001(2)

## Reprezentarea în cod direct pe 8 biți

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

[x]D=

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |

[y]D=

## Reprezentarea în cod invers pe 8 biți

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

[x]I =

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |

[y]I =

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 1 | 0 | 0 | 0 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în cod complementar pe 8 biți

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 |

[x]C =

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |

[y]C =

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | - | -  2 | -  2 | -  2 | -  2 | -  2 | -  2 | -  2 | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | 1 | 0 | 0 | 0 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Adunarea în cod complementar

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| [x]C | Å | [y]C | = | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | Å |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | >=28 | - |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |  | ?avem depșire? | NU |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în virgulă fixă (pe 8 biți, cu virgula exact la mijloc)

23,5(10)=17,8(16)=10111,1(2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  | - |  |  |  |  | 0 |  |  |  |  |  | + |  |  | 0 |  |  |  |  |  |  |  |  |  |  | + |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în virgulă mobilă (pe 32 biți cu mantisă subunitară normalizată)

23,5(10)=17,8(16)=10111,1(2)=0,101111(2)\*25

C=E+Q=5+27 -1 = 27 + 4= (10000000+100)(2)=10000100(2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |
| S |  |  |  | C | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Curs 3

## Reprezentarea în virgulă mobilă (simplă precizie (pe 32 biți) cu mantisă supraunitară)

-179,27(10)=- 263,21 (8)=- 10110011,010001(2)=- 1,0110011010001 (2)\*27

10 ® 2 utilizând baza intermediară 8

179(10) ® ?(8) prin împărțiri succesive

179:8=22 rest 3

22:8=2 rest 6

2:8=0 rest 2

0,27(10) ® ?(8) prin înmulțiri successive

0,27\*8=2,16

0,16\*8=1,28

0,28\*8=2,24

0,24\*8=1,92

0,92\*8=7,36

0,36\*8=2,88

C=E+Q= 7+127=134= 7+27 -1 = 27 + 6 =10000110 (2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 |  |  |  |  |  |  |  |  |
| S |  |  |  | C | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în virgulă mobilă (simplă precizie (pe 32 biți) cu mantisă subunitară normalizată)

-179,27(10)=- 263,21 (8)=- 10110011,010001(2)=- 0,10110011010001 (2)\*28

10 ® 2 utilizând baza intermediară 8

179(10) ® ?(8) prin împărțiri succesive

179:8=22 rest 3

22:8=2 rest 6

2:8=0 rest 2

0,27(10) ® ?(8) prin înmulțiri successive

0,27\*8=2,16

0,16\*8=1,28

0,28\*8=2,24

0,24\*8=1,92

0,92\*8=7,36

~~0,36\*8=2,88~~

C=E+Q= 8+127=134= 8+27 -1 = 27 + 7 =10000111 (2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |  |  |  |  |  |  |  |  |
| S |  |  |  | C | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în virgulă mobilă (simplă precizie (pe 32 biți) cu mantisă subunitară normalizată)

(+5/162)(10)=(5\*16-2)(10)=0,05(16)=0,00000101(2)=0,101(2)\*2-5

C=E+Q= -5+127=122= -5+27 -1 = 1111111-101 =1111010 (2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |
| S |  |  |  | C | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Reprezentarea în virgulă mobilă (simplă precizie (pe 32 biți) cu mantisă supraunitară)

(+5/162)(10)=(5\*16-2)(10)=0,05(16)=0,00000101(2)=1,01(2)\*2-6

C=E+Q= -6+127=121= -6+27 -1 = 1111111-110 =1111001 (2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |
| S |  |  |  | C | 8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  | M | 23 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Logica propozițiilor

ØpÙq /º Ø(pÙq)

ØpÙq º (Øp)Ùq