**Laboratoriya ish №4**

**Mavzu:Axborotlarni kodlash usullari. Kodlarni turlari.**

          Kundalik hayotimizda ishlatiladigan o'nlik sanoq sistemasidagi sonlar ustida arifmetik amallar bajarish usullarini bilamiz. Mazkur usullar boshqa barcha pozitsiyaga bog'liq bo'lgan sanoq sistemalari uchun ham o'rinlidir.  
          O'nlik sanoq sistemasida qo'shish amalini ko'rsak, biz avval birliklarni, so'ng o'nliklarni, keyin yuzliklar va hakazolarni o'zaro qo'shib boramiz. Bu jarayon barcha pozitsi-yali sanoq sistemalar uchun o'rinli bo'lib, toki oxirgi qiymat bo'yicha eng katta razryadni qo'shishgacha davom etadi. Mazkur jarayonda shu narsani doim eslash kerakki, agar biror raz-ryad sonlarini qo'shganimizda natija sanoq sistema asosi qiymatidan katta chiqsa, yig'indining sanoq sistema asosidan katta qismini keyingi razryadga o'tqazish kerak.  
          Masalan, o'nlik sanoq sistemasida:

19327510

7953810

198310

---------------------

27479610

### Shuni yodda tutish kerakki, sanoq sistema asosining qiymati 10 deb hisoblanadi (o'nlik ma'nosida). Shu sababli ham sanoq sistema asosidan keyingi sonlar (toki o'sha sanoq sistema asosiga karrali son chiqmaguncha) 11, 12,.... va h. deb yuritiladi. Oʽnlik sonlarni kodlanishi

Keyingi savol: Biz qanday qilib, bitlardan foydalanib sonlarni ifodalaymiz?

Eng oddiy usul - bu har bir raqamni bitning noyob satri orqali son koʽrinishida ifodalash yoʽlidir. Bunda 4 (2 x 2) da 2 bitning noyob kombinatsiyasi bor, ya’ni:

00 01 10 11

Bunda har bir bit 0 yoki 1 boʽla oladi. Har biri 2 bitning noyob satrini beradigan 2 × 2 = 4 imkoniyatli 2 ta bit bor.

Bu yerda har biri 3 bit noyob satrini beradigan 2 × 2 = 4 imkoniyatli 2 ta bit bor. 3 bit larning teng tizimi berilgan 2×2×2=8 000 001 010 011 100 101 110 111 iborat boʽladi.

Oʽnlik sanoq tizimidagi sonlar: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. 3-bitlik tizimlar oʽnlik sanoq tizimi raqamlari yordamida aks ettirish uchun samarali emas. Bizga kamida 4 ta bitlar kerak. 4 bitlik tizimning soni 2×2×2×2=16 boʽladi va ular:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 |
| 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 |

Biz bu oʽn oltilik tizimning hohlagan oʽntasini asossiz tanlay olamiz va 0, 2, … 9 gacha boʽlgan raqamlarni aks ettirish uchun ularning har birini tayinlaymiz. 4 bitlik tizim va 10 talik raqamlar orasidagi xaritani chizish oʽntalik raqamlarni ikkilik kodlashdir. Bu tayinlangan ishlardan biri tabiiy ikkilik kodlangan oʽnlik raqamlar olib nomlanadi, 2-4- jadvalda koʽrsatilgan.[[1]](#footnote-1)

**2.4-jadval.** Oʽnlik tizimdagi raqamlarni ikkilik tizim orqali ifodalsh.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0000 | 0001 | 0010 | 0011 | 0100 | 0101 | 0110 | 0111 | 1000 | 1001 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

  Buni tushunish uchun, keling, misollarga murojaat qilaylik.  
          Masalan, sakkizlik sanoq sistemasida 8 ta raqam bor:  
                    0, 1, 2, 3, 4, 5, 6, 7.  
          Sanoq sistema asosi 8 esa 10 deb hisoblanadi. Buni nazarga olib, o'nlik sanoq sistemasi-dagi sonlar sakkizlik sanoq sistemasida quyidagicha qiymat oladi:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **10 lik sanoq sistemasidagi sonlar** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | | **8 lik sanoq sistemasidagi sonlar** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 20 |             Ikkilik sanoq sistemasida 2 ta raqam: 0 va 1 mavjud. O'nlik sanoq sistemasidagi sonlar ikkilik sanoq sistemasida quyidagicha ifodalanadi:   |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **10 lik sanoq sistemasi** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | **2 lik sanoq sistemasi** | 0 | 1 | 10 | 11 | 100 | 101 | 110 | 111 | 1000 | 1001 | 1010 | 1011 | 1100 |             Bu kabi taqqoslashni boshqa sanoq sistemalar uchun ham ko'rsatish mumkin.  **O'nlik, o'noltilik va ikkilik sanoq sistemalarini solishtirish jadvali**   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **O'nlik** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | **O'n oltilik** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F | | **Ikkilik** | 0 | 1 | 10 | 11 | 100 | 101 | 110 | 111 | 1000 | 1001 | 1010 | 1011 | 1100 | 1101 | 1110 | 1111 | |

Услубий кўрсатма: Мисол : Х=13(10)

\_ 13 2

12 \_6 2

1 6 \_3 2

0 2 1

1

Натижа: 13(10) = 1101 (2)

Х=0,25(10)

0 , 25

x

2

—————

0 50

x

2

—————

1 00

Натижа: 0,25(10) = 0,01 (2)

Топшириқлар:

1. Ихтиёри 4та сонни ўнликдан 2 га ўтказинг ва ўнлик саноқ системасига қайтаринг
2. Ихтиёри 4та сонни ўнликдан 8 га ўтказинг ва ўнлик саноқ системасига қайтаринг
3. Ихтиёри 4та сонни ўнликдан 16 га ўтказинг ва ўнлик саноқ системасига қайтаринг.
4. Туғилган йилингизни 2, 8 саноқ системасига ўтказинг ва 10ликка қайтаринг.
5. Компьютерда калкулятор дастурига кириб мисолларингизни тўғрилигини текшириб кўринг.

**Ikkilik sanoq sistemasida arifmetik amallar bajarish**

          Ma'lumki ikkilik sanoq sistemasi faqat ikkita: 0 va 1 raqamlaridan tashkil topgan. Shu sistemada qo'shish, ayirish va ko'paytirish amallari quyidagicha bajariladi:

|  |  |  |
| --- | --- | --- |
| **Ko'paytirish** | **Qo'shish** | **Ayirish** |
| 0\*0=0  0\*1=0  1\*0=0  1\*1=1 | 0+0=0  0+1=1  1+0=1  1+1=10 | 0-0=0  1-0=0  10-0=1 |

          Endi ikkilik sanoq sistemasidagi sonlar ustida turli arifmetik amallar bajarishga doir misollar ko'ramiz.

**Топшириқлар:**

1. 1111112+1111012 ;
2. 1111112\*1111012
3. 110,112+1101,012;
4. 110,112\*1101,012

*Услубий кўрсатма:*

*1111112*

*+1111012*

*----------------*

*11111 002*

**Sakkizlik sanoq sistemasida arifmetik amallar bajarish**

           Yuqorida ayitib o’tganimizdek, sakkizlik sanoq sistemasida sonlarni yozish uchun hammasi bo’lib sakkizta raqam (0,1,2,3,4,5,6,7 ) dan foydalaniladi, demak maskur sanoq sis-temaning asosi 8 ga tengdir. Shuning uchun har qanday amallar mana shu sakkiz raqam orqali amalga oshiriladi.

**QO'SHISH JADVALI:**

**+ 0** **1** **2** **3** **4** **5** **6** **7**

**0** 0 1 2 3 4 5 6 7

**1** 1 2 3 4 5 6 7 10

**2** 2 3 4 5 6 7 10 11

**3** 3 4 5 6 7 10 11 12

**4** 4 5 6 7 10 11 12 13

**5** 5 6 7 10 11 12 13 14

**6** 6 7 10 11 12 13 14 15

**7** 7 10 11 12 13 14 15 16

**Sakkizlik sanoq sistemasida KO'PAYTIRISH JADVALI:**

**x 0** **1** **2** **3** **4** **5** **6** **7**

**0** 0 0 0 0 0 0 0 0

**1** 0 1 2 3 4 5 6 7

**2** 0 4 6 10 12 14 16 20

**3** 0 3 6 11 14 17 22 25

**4** 0 4 10 14 20 24 30 34

**5** 0 5 12 17 24 31 36 43

**6** 0 6 14 22 30 36 44 52

**7** 0 7 16 25 34 43 52 61

**Топшириқлар:**

1. Sakkizlik sanoq sistemasida qo’shish va ko’paytirish jadvallarini tuzilishini taxlil qiling.
2. 25478+65438;
3. 25478\*65438;
4. 546,78+7663,78;
5. 546,78\*7663,78

**O’n oltilik sanoq sistemasida arifmetik amallar bajarish**

Sonlarni o’n oltilik sanoq sistemasida ifodalash uchun o’n oltita raqam: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F dan foydalaniladi. Bu yerda A, B, C, D, E, F belgilari mos ravishda o’nlik sanoq sistemasining 10, 11, 12, 13, 14, 15 sonlari kabidir. Ularni raqam-lardan farqlash uchun lotin harflari bilan belgilaymiz. O’n oltilik sanoq sistemasida o’n olti soni 10 ko’rinishda yoziladi.  
           O’n oltilik sonlar ustida arifmetik amal bajarish qoidalari ham o’nlik sonlardagiga o’xshash, lekin ko’p xonali sonlar ustida amallar bajarilayotganda bir xonali o’n oltilik sonlarni qo’shish va ko’paytirish jadvalidan foydalanish kerak.

**Топшириқлар:**

1. o’n oltilik sanoq sistemasida qo’shish va ko’paytirish jadvallarini tuzing.
2. 29A+B32;
3. 29A\*B32;
4. AB3+B6F
5. AB3\*B6F

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1. V. Rajaraman, Introduction to Information technology (second edition), PHI Learing Private Limited, India 2013 y. 44 p. [↑](#footnote-ref-1)