Subject 1

Truță David:

* I chose: b1 = 8, x = 427132(8) , y = 62341(8)

110000

427132(8)+

62341(8)

511473(8)

x(8) + y(8) = s(8) ==> s(8) = 511473(8)

2 + 1 = 3; 3 % 8 = 3; 3 / 8 = 0

3 + 4 = 7; 7 % 8 = 7; 7 / 98= 0

1 + 3 = 4; 4 % 8 = 4; 4/8

7 + 2 = 9; 9 % 8 = 1; 9 / 8 = 1

2 + 6 + 1 = 9; 9 % 8 = 1; 9 / 8 = 1

1 + 4 = 5; 5 % 8 = 5

* b2 is 16 and I chose: z(16) = A32F38(16) , f(16) = 3(16)

z(16) \* f(16) = p(16) ==> p(16) = 1E98DA8(16)

1002010

A32F38(16)\*

3 (16)  1E98DA8(16)

8 \* 3 + 0= 24; 24 % 16 = 8; 24 / 16 = 1

3 \* 3 + 1 = 10; 10 % 16 = 10 = A; 10 / 16 = 0

F \* 3 + 0= 45; 35 % 16 = 13 = D; 45 / 16 = 2

2 \* 3 + 2= 8; 8 % 16 = 8; 8 / 16 = 0

3 \* 3 = 9; 9 % 16 = 9; 9 / 16 =0

3 \* A = 30; 30 % 16 = 14 = E; 30 / 16 = 1

Trifan Octavian:

* I receive: s = 511473(8), y = 62341(8), b1=8

110000

511473(8) **-**

62341(8)

427132(8)

s(8) - y(8) = x(8) ==> x(8) = 427132(8)

3 -1 = 2; 2 % 8 = 2; 2 / 8 = 0

7 - 4 = 3; 3 % 8 = 3; 3 / 8 = 0

4 - 3 = 1; 1 % 8 = 1; 1 / 8 = 0

1 -2 = -1; -1 + 8 = 7, carry = 1

1 - 6 - 1 = -6; -6 + 8 = 2, carry = 1

5 – 1 = 4

* I receive: p = 1E98DA8(16), f = 3(16), b2=16

p(16) : f(16) = z(16) ==> z(16) = A32F38(16)

We will use successive divisions directly into base 16, while temporary converting into base 10.

1E98DA8(16) | 3(16)

/            |       A32F38

1E(16)

   /

09(16)

 /

   08(16)

 /

           2D(16)

 /

            0A

 /

            18 R=0

1E(16)=1\*16+14=30(10), 30 div 3 = 10 = A(16), 30 mod 3 = 0

09 (16)=9(10), 9 div 3 = 10 = 3(16), 9 mod 3 = 0

08 (16)=9(10), 8 div 3 = 2 = 2(16), 8 mod 3 = 2

2D (16)=2\*16+13=32+13=45(10), 45 div 3 = 15 =F(16), 45 mod 3 = 0

0A (16)=10(10), 10 div 3 = 3 = 3(16), 10 mod 3 = 1

18 (16)=1\*16+8=24(10), 24 div 3 = 8 = 8(16), 24 mod 3 = 0

The final result is A32F38(16)

A32F38(16)= 1E98DA8(16): 3(16)

Our problem is now finished.

Subject 2

Octavian Trifan: I used the **substitution method** for converting from base b=5 to base h=12.

* I chose: b = 5, h = 12, x = 12431,121(5)

1(5)=1(12), 2(5)=2(12), 4(5)=4(12), 3(5)=3(12) - **all the digits from the source representation are converted into the destination base**

12431,121(5) = 1(12)\*54(12) + 2(12)\*53(12) + 4(12)\*52(12) + 3(12)\*51(12) + 1(12)\*50(12) +

+ 1(12)\*5-1(12) + 2(12)\*5-2(12) +++ 1(12)\*5-3(12)=

= 441(12) + 18A(12) +84(12) + 13(12) + 1(12) + 0,244(12) + 0,0AA(12) + 0,011(12)

= 6A7,365(12)

We multiply the numbers already in base 12, taking in account the carries:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **2** | **0** |  |  | **0** | **0** |  |  | **4** | **2** | **0** |  | **1** | **0** | **0** |  |  | **0** | **0** |  |  |  | **0** |  |
|  | **5** | **\*** |  | **2** | **1** | **\*** |  |  | **A** | **5** | **\*** |  | **A** | **5** | **\*** |  | **2** | **1** | **\*** |  |  | **3** | **\*** |
|  | **5** |  |  |  | **5** |  |  |  |  | **5** |  |  |  | **2** |  |  |  | **4** |  |  |  | **5** |  |
| **2** | **1** |  |  | **A** | **5** |  |  | **4** | **4** | **1** |  | **1** | **8** | **A** |  |  | **8** | **4** |  |  | **1** | **3** |  |

Corresponding to the fractional part calculated below:

10(12)=1\*12+0=12, 12 div 5 = 2, 12 mod 5 = 2

20(12)=2\*12+0=24, 24 div 5 = 4, 12 mod 5 = 2

20(12)=2\*12+0=24, 24 div 5 = 4, 12 mod 5 = 2

20(12)=2\*12+0=24, 24 div 5 = 4, 12 mod 5 = 2

44(12)=4\*12+4=48+4=52, 52 div 5 = 10 (A), 52 div 5 = 2

24(12)=2\*12+4=24+4=28, 28 div 5 = 5, 28 div 5 = 3

34(12)=3\*12+4=36+4=40, 40 div 5 = 8, 50 mod 5 = 0

Corresponding to the integral part calculated above:

5\*5+0=25, 25 div 12 = 2, 25 mod 12 = 1

52(12)= 21(12)

5\*1+0=5, 5 div 12 = 0, 5 mod 12 =0

2\*5+0=10, 10 div 12 = 0, 10 mod 12 = 10 (A)

53(12)= A5(12)

5\*5+0=25, 25 div 12 = 2, 25 mod 12 = 1

10\*5+2=52, 52 div 12 = 4, 52 mod 12 = 2

54(12)= 441(12)

5\*2+0=10, 10 div 12 = 0, 10 mod 12 = 10 (A)

10\*2+0=20, 20 div 12 = 1, 20 mod 12 = 8

1\*4+0=4, 4 div 12 = 0, 4 mod 12 = 4

2\*4+0=8, 8 div 12 =0, 8 mod 12 = 8

3\*5+0=15, 15 div 12 = 1, 15 mod 12 =3

Now it’s time to calculate the fractional part, dividing the numbers as many times as needed, with a precision of 3 digits!

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1,00( 12)|  5(12)    /    | 0,244 q    10   /  20   /     20 | 2,00 (12)|   5(12)    /            |  0,444q   20     /   20   /  20 | 0,444 (12)   |  5(12)      /          |  0,0AA q      4       /   44   /     44 | 0,244 | 5(12)  /            |0,058q    10   /  34   /     20 | 0,058( 12)|  5(12)    /            | 0,011 q    5   /  8   /     3 |

**The final answer is 6A7,365(12)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **c** | **1** | **1** |  |  |  | **1** | **+(12)** |
|  | **4** | **4** | **1** |  |  |  |  |
|  | **1** | **8** | **A** |  |  |  |  |
|  |  | **8** | **4** |  |  |  |  |
|  |  | **1** | **3** |  |  |  |  |
|  |  |  | **1** |  |  |  |  |
|  |  |  | **0** | **,** | **2** | **4** | **4** |
|  |  |  | **0** | **,** | **0** | **A** | **A** |
|  |  |  | **0** | **,** | **0** | **1** | **1** |
|  | **6** | **A** | **7** | **,** | **3** | **6** | **5** |

Truță David: I received: y = 6A7,365(12), b=5

Integral part: 12431 **I use successive division method to from b12 convert in b5.**

1 220

0,365(12)\*

5 (12)

1,581(12)

25%12=1; 25/12=2

32%12=8;32/12=2

17%12=5;17/12=1

2 300

0,581(12)\*

5 (12)

2,445(12)

5%12=5; 5/12=0

40%12=4;40/12=3

28%12=4;28/12=2

1 120

0,445(12)\*

5 (12)

1,9A1(12)

25%12=1; 25/12=2

22%12=10;22/12=1

21%12=9;21/12=1

6A7(12) | 5(12)

/            |       146

1A

   /

27 *Calculations done in source base,*

 /                 *but we go temp. in base 10*

   R1

6(12) = 6(10) ; 6/5=1;6%5=1

1A(12)=10+12=22(10); 22/5=4; 22%5=2

27(12)=7+12\*2=31(10);31/5=6;31%5=1

146(12) | 5(12)

/            |      033

14

   /

16

 /

   R3

5(12)=5(10);1/5=0; 1%5=1

14(12)=4+12=16(10); 16/5=3;16%5=1

16(12)=6+12=18(10); 18/5=3; 18%5=3

33(12) | 5(12)

/            |      07

33

   /

R4

3(12)=3(10);3/5=0; 3%5=3

33(12)=3+12\*3=39(10); 39/5=7;39%5=4

7(12) | 5(12)

/            |      1

33

   /

R2

7(12)=7(10);7/5=1; 7%5=2

1(12)| 5(12)

/         | 0

R1

**For the decimal part, I used successive multiplication.**

**The integral part of the multiplications below forms the decimal part from top to bottom.**

Decimal part:0,121

0,365(12)\*5(12) = 1,581 (12)

0,581(12)\* 5(12) = 2,445(12)

0,445(12)\* 5(12) = 1,9A1(12)

**y = 6A7,365(12) = 12431,121(5)**

Subject 3 – Option 3

Truță David:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S** | **I=15 bits, integer part               ->                  ,  <-     F=16 bits , fractional part** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **0** | **1** | **0** | **1** | **1** | **1** | **1** | **0** | **0** | **1** | **1** | **0** | **0** | **1** | **0** | **0** | **0** | **0** | **1** | **1** | **0** | **1** | **0** | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **1** | **0** |
| **5** | | | | **E** | | | | **6** | | | | **4** | | | | **3** | | | | **5** | | | | **C** | | | | **2** | | | |

I have to choose a number smaller than 215-1 = 32.767 in order to not get an **overflow** in the 15 bits(I=15) limit of the integral part. I chose the number 24.164,21 . In order to represent the number in a fixed point notation, on 32 bits, I have to convert it in base 2.  **x(10) = 24.164,21**

Decimal part:

0,21 \* 2 = 0,42

0,42 \* 2 = 0,84

0,84\* 2 = 1,68 **I used the successive multiplication**

0,68 \* 2 = 1,36 **method**

0,36 \* 2 = 0,72

0,72 \* 2 = 1,44

0,44 \* 2 = 0,88 We get past 16 bits(F=16), so we

0,88 \* 2 = 1,76 stop here, because there is no

0,76 \* 2 = 1,52 space left for the decimal part to

0,52 \* 2 = 1,04 be represented in full, so when

0,04 \* 2 = 0,08 Student 2 finds the number in

0,08 \* 2 = 0,16 decimal he will probably get

0,16 \* 2 = 0,32 something between 24.164,20

0,32 \* 2 = 0,64 and 24.164,21

0,64 \* 2 = 1,28

0,28 \* 2 = 0,56

Integral Part:

24.164/2 r0

12.082/2 r0

6.041/2 r1

3.020/2 r0

1.510/2 r0 **I used the successive division**

755/2 r1 **method**

377/2 r1

188/2 r0

94/2 r0

47/2 r1

23/2 r1

11/2 r1

5/2 r1

2/2 r0

1/2 r1

0

We convert in hexadecimal using rapid conversions, in order to get the memory location.

x(2) = (0)101 1110 0110 0100,0011 0101 1100 0010

x(16) = 5E6435C2 = M(16)

Trifan Octavian:

I receive M­­(16)= 5E6435C2(16) and use the fixed-point representation table to find the corresponding binary representation. Because the number represented is in base 16, we will divide each digit of the source into 4 digits in our base 2 representation (because 24=16)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S** | **I=15 bits, integer part               ->                  ,  <-     F=16 bits , fractional part** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **0** | **1** | **0** | **1** | **1** | **1** | **1** | **0** | **0** | **1** | **1** | **0** | **0** | | **1** | **0** | **0** | **0** | | **0** | **1** | **1** | **0** | **1** | **0** | **1** | **1** | **1** | **0** | **0** | **0** | **0** | **1** | **0** |
| **5** | | | | **E** | | | | **6** | | | | | **4** | | | | | **3** | | | | **5** | | | | **C** | | | | **2** | | | |

With the binary representation I can compute our final number using **substitution method**:

214+212+211+210+29+26+25+22+2-3+2-4+2-6+2-8+2-9+2-10+2-15=

= 16384 + 4096 + 2048 + 1024 + 512 + 64 + 32 + 4 + 1/8 + 1/16 + 1/256+ 1/512 + 1/1024 + 1/32768=

= 24164 + 0.125 + 0.0625 + 0.015625 + 0.00390625 + 0.001953125 + 0.0009765625 + 0.00003051757

= 24164, 20999145507(10)

The problemis concluded