Answer to the question number : 1

(a) $(101110010001)_2 = 1\times2^{11} + 0\times2^{10} + 1\times2^9 + 1\times2^8$
$+ 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2$
$+ 0\times2^1 + 1\times2^0$
$= 2048 + 0 + 512 + 256 + 128 + 0 + 0$
$+ 16 + 0 + 0 + 0 + 1$

$= (2961)_{10}$ Ans

(b) $(11011.101)_2 = 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 + 1\times2^{-1}$
$+ 0\times2^{-2} + 1\times2^{-3}$
$= 16 + 8 + 0 + 2 + 1 + 0.5 + 0 + 0.125$

$= (27.625)_{10}$ Ans

Answer to the question no: 2

$(4195)_{10}$ to binary.

		remainder	
2	4195		
2	2097	1	→ LSB
2	1048	1	
2	524	0	
2	262	0	
2	131	0	
2	65	1	
2	32	1	
2	16	0	
2	8	0	
2	4	0	
2	2	0	
2	1	0	
2	0	1	→ MSB

So, $(4195)_{10} = (1000001100011)_2$ Ans

Answer to the question no: 3

(a) $(45)_8 = 4 \times 8^1 + 5 \times 8^0$

$= 32 + 5$

$= (37)_{10}$ Ans

(b) $(2173)_8 = 2 \times 8^3 + 1 \times 8^2 + 7 \times 8^1 + 3 \times 8^0$

$= 1024 + 64 + 56 + 3$

$= (1147)_{10}$ Ans

Answer to the question no: 4

$(513)_{10}$ to hexadecimal.

		remainder	
16	513		
16	32	1	→ LSB
16	2	0	
16	0	2	→ MSB

So, $(513)_{10} = (201)_{16}$ Ans

Answer to the question no: 5

$(10110110)_2$ to hexadecimal

~~don~~ we need to convert the binary number in group of 4 partition.

$$11011100_2 = 110\ 1100 = (6C)_{16}$$

Ans

Answer to the question no: 6

(a) $(29)_{12} = (?)_7$

Firstly, base 12 to base 10,

$(29)_{12} = (2 \times 12^1) + (9 \times 12^0) = (33)_{10}$

secondly, base 10 to 7,

		remainder	
7	33		
7	4	5	→ LSB
7	0	4	→ MSB

So, $(29)_{12} = (45)_7$ Ans

(b) $(10110111)_5 = (?)_4$

Firstly, Base 5 to Base 10,

$(10110111)_5 = (1\times5^7) + (0\times5^6) + (1\times5^5) + (1\times5^4) + (0\times5^3) + (1\times5^2) + (1\times5^1) + (1\times5^0)$

$= 78125 + 0 + 3125 + 625 + 0 + 25 + 5 + 1$

$= (81906)_{10}$

Secondly, Base 10 to base 4 calculation,

4	81906	remainder
4	20476	2 → LSB
4	5119	0
4	1279	3
4	319	3
4	79	3
4	19	3
4	4	3
4	1	0
4	0	1 → MSB

So, $(10110111)_5 = (103333302)_4$ Ans

Answer to the question no: 7

Addition

$(412)_9$
$+(134)_9$
$(546)_9$

$2+4=6<9$
$1+3=4<9$
$4+1=5<9$

Ans

Converting the value into decimal,

$(546)_9$
$= 5\times9^2 + 4\times9^1 + 6\times9^0$
$= (447)_{10}$ Ans

Substraction

$(412)_9$
$-(134)_9$
$(267)_9$

$9+2=11$
$0+5=5$

Converting the value into decimal,

$(267)_9$
$= 2\times9^2 + 6\times9^1 + 7\times9^0$
$= 162 + 54 + 7$
$= (223)_{10}$ Ans

Multiplication

$(412)_9$
$\times(134)_9$
1748
1336
412
$(56418)_9$

$9)12(1$ $9)6(1$
3 5
7

Converting the value into decimal,

$(56418)_9$
$= 5\times9^4 + 6\times9^3 + 4\times9^2 + 1\times9^1 + 8\times9^0$
$= 32805 + 4374 + 324 + 9 + 8$
$= (37520)_{10}$ Ans

for varifying the addition value converting base_9 to base -10,

$(412)_9 = 4\times4^2 + 1\times4^1 + 2\times4^0 = (335)_{10}$

$(134)_9 = 1\times5^2 + 3\times9^1 + 4\times9^0 = (112)_{10}$

Addition of decimal,

$$\begin{array}{r} (335)_{10} \\ (112)_{10} \\ \hline (447)_{10} \end{array}$$

Now converting the decimal to ~~binary~~ base-9 for verification..

9	447	
9	49	6 → LSB
9	5	4
9	0	5 → MSB

$(546)_9 = (545)_9$ (verified)

Now, ~~converting the~~ substracting two decimal values,

$$\begin{array}{r} (335)_{10} \\ (112)_{10} \\ \hline (223)_{10} \end{array}$$

Converting two base-9,

9	223	
9	24	7
9	2	8
	0	2

$(267)_9 = (267)_9$ (verified)

multiplying the decimal value,

~~(412)10~~ $(335)_{10}$

$\times (112)_{10}$

670

335x

335xx

$(37520)_{10}$

converting to base-9,

37520	
4168	8
463	1
51	4
5	6
0	5

$(37520)_{10} = (56418)_9$

$(56418)_9 = (56418)_9$ (verified)

Ans

Answer to the question no: 8

Given, $(01000010)_{1s}$

First, Converting into decimal,

$(01000010)_2$

$= 0\times2^7 + 1\times2^6 + 0\times2^5 + 0\times2^3 + 0\times2^2 + 1\times2^2 + 0\times2^0$

$= 0+64+0+0+0+0+2+0$

$=(66)_{10}$

Lastly, Converting into 8 bit-ones,

$(01000010)_{1s} = (+66)_{10}$

Ans

Answer to the question no. 9

Given,

$(10111100)_{2's}$

First, inverecting, (10111100) , $-(01000100)$

~~(110 (10111100) ⇒ (010000~~

~~(01111100)~~

Secondly, converting binary to decimal ,

$-(01000100)$

$= 0\times2^7 + 1\times2^6 + 0\times2^5 + 0\times2^4 + 0\times2^3 + 1\times2^2$

$+ 0\times2^1 + 0\times2^0$

$= 0 + 64 + 0 + 0 + 0 + 4 + 0 + 0$

$= -(68)_{10}$

$\therefore (10111100)_{2's} = -(68)_{10}$

Ans

Answer to the question no: 10

Given, 91 - 455 in 2's & 1's complement

First, converting in 1's complement

Now, converting this two numbers in decimal.

		remainder
2	91	
2	45	1 → LSB
2	22	1
2	11	0
2	5	1
2	2	1
2	1	0
2	0	1 → MSB

$(91)_{10} = (1011011)_2$

		remainder
2	455	
2	245	1 → LSB
2	124	1
2	62	0
2	31	0
2	15	1
2	7	1
2	3	1
2	1	1
2	0	1 → MSB

$(455)_{10} = (111100011)_2$

Converting in 1's complement.

$(1011011)_2 \rightarrow (1011011)_2$

$-(111100011)_2 \rightarrow (000001100)_2$

$$\begin{array}{r} 001\overset{1}{0}11011 \\ 000001100 \\ \hline (000110011)_{1's} \end{array}$$

[No overflow]
[Converted to 10 bit]

converting binary to decimal,

$(0001100111)_2 = 0\times2^9 + 0\times2^8 + 0\times2^7 + 1\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$

$= 0+0+0+64+32+0+0+4+2+1$

$=(103)_{10}$ Ans

Secondly, converting into 1's complement,

Now, inverting second values binary number, $(11111100 11)_2 \rightarrow (00000011 00)_2$

So, adding 1, $00000\ 1100_2 + 1$

$00000\ 1101_2$

Now, Let's add,

$$\begin{array}{r} 00101^{1}1^{1}0^{1}11_2 \\ +\ 00000\ 1101_2 \\ \hline (0001101000)_2 \end{array}$$

[No carry, No overflow]

Ans [In 10 bit]

Lastly, converting into decimal,

$(0001101000)_2 = 0\times2^8 + 0\times2^7 + 1\times2^6 + 1\times2^5 + 0\times2^4 + 1\times2^3 + 0\times2^2 + 0\times2^1 + 0\times2^0$

$= 0+0+64+32+0+8+0+0+0$

$=(104)_{10}$ Ans

Answer to the question no: 11

Given, 2 8GB DDR4 RAM's costs $(1C2)_{16}$ each

Also, RTX costs $(10010110000)_2$ dollars

Friend gave $(4064)_8$ dollars

Now, converting all the values in decimal,

$(1C2)_{16} = 1\times16^2 + 12\times16^1 + 2\times16^0$

$= 256 + 192 + 2$

$= (450)_{10}$

$(10010110000)_2 = 1\times2^{10} + 0\times2^9 + 0\times2^8 + 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 0\times2^0$

$= 1024 + 0 + 0 + 128 + 0 + 32 + 16 + 0 + 0 + 0 + 0$

$= (1200)_{10}$

$(4064)_8 = 4\times8^3 + 0\times8^2 + 6\times8^1 + 4\times8^0$

$= 2048 + 0 + 48 + 4$

$= (2100)_{10}$

I have 2100_{10} dollars, If I buy those two components I will have = $2100_{10} - (450+1200)_{10}$

$= (450)_{10}$

∴ I have left $(450)_{10}$ dollars.

Ans