CSE260 Assignment 1

Section 14
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1] a] $(101110010001)_2$

$= 1\times2^0 + 0\times2^1 + 0\times2^2 + 0\times2^3 + 1\times2^4 + 0\times2^5 + 0\times2^6 + 1\times2^7 + 1\times2^8 + 1\times2^9 + 0\times2^{10} + 1\times2^{11}$

$= (2961)_{10}$

b] $(11011.101)_2$

$= 1\times2^0 + 1\times2^1 + 0\times2^2 + 1\times2^3 + 1\times2^4 + 1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$

$= (27.625)_{10}$

2) $(4195)_{10}$

↑ LSB

= 2 | 4195

2 | 2097 − 1

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

0 − 1

MSB

$(4195)_{10} = (1000001100011)_2$

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

$= 5 + 32$

$= (37)_{10}$

3)

b) $(2173)_8$ 1

$= 3 \times 8^0 + 7 \times 8^1 + 1 \times 8^2 + 2 \times 8^3$

$= (1147)_{10}$

4) $(513)_{10}$

$$= \begin{array}{r|l} 16 & 513 \\ \hline 16 & 32 - 1 \\ \hline 16 & 2 - 0 \\ \hline & 0 - 2 \end{array} \quad \begin{array}{l} \uparrow \text{LSB} \\ \\ \downarrow \text{MSB} \end{array}$$

$\therefore (201)_{16}$

5] $(101101110)_2$

$$\therefore \underbrace{0001}_{1},\underbrace{0110}_{6},\underbrace{1110}_{E}$$

$\therefore (16E)_{16}$

6] a] $(29)_{12}$ we need to convert it into 7 base conversion

Let's convert it to decimal

$= 9\times 12^0 + 2\times 12$

$= (33)_{10}$

Now, convert it to 7 base.

$$\begin{array}{r|l} 7 & 33 \\ \hline 7 & 4 - 5 \\ \hline & 0 - 4 \end{array}$$

$(45)_7$

$\therefore (29)_{12} = (45)_7$

b) $(10110111)_5$ we need to convent it to 4 base

converting it into decimal we get,

$\Rightarrow 1\times5^0 + 1\times5^1 + 1\times5^2 + 0\times5^3 + 1\times5^4 + 1\times5^5$

$+ 0\times5^6 + 1\times5^7$

$= (81906)_{10}$

Now,

4 | 81906 ↑ LSB
4 | 20476 - 2
4 | 5119 - 0
4 | 1279 - 3
4 | 319 - 3
4 | 79 - 3
4 | 19 - 3
4 | 4 - 3
4 | 1 - 0
0 - 1 MSB

∴ $(103333302)_4$

∴ $(10110111)_5 = (103333302)_4$

7] $(412)_9$

$(134)_9$

addition

$(412)_9$
$(134)_9$

$(546)_9$

subtraction

$(412)_9$
$(134)_9$

$(267)_9$

Multiplication

$(412)_9$
$(134)_9$

1748
1336X
412XX

$(56418)_9$,

∴ Base-9

addition = $(546)_9$ —— ①

subtraction = $(267)_9$ —— (11)

Multiplication = $(56418)_9$ —— (111)

Let us convert base-9 to decimal,

$(412)_9 = 2 \times 9^0 + 1 \times 9^1 + 4 \times 9^2$

$= (335)_{10}$

$(134)_9 = 4 \times 9^0 + 3 \times 9^1 + 1 \times 9^2$

$=$ ~~$(412)_{10}$~~ $(112)_{10}$

Addition	Substraction	Multiplication
$(335)_{10}$	$(335)_{10}$	$(335)_{10}$
$(112)_{10}$	$(112)_{10}$	$(112)_{10}$
$(447)_{10}$	$(223)_{10}$	670
		335 ×
		335 ×
		$(37520)_{10}$

~~Ba~~ Decimal

addition = $(447)_{10}$

substraction = $(223)_{10}$

multiplication = $(37520)_{10}$

From ① we get base 9 addition is $(546)_9$

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

$\therefore$ ~~8~~ addition verified. ~~with~~

From ⑪ base-9 subtraction is $(267)_9$

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

$\therefore$ subtraction ~~verify~~ verified.

From ⑪ base-9 multiplication is $(56418)_9$

$\therefore (56418)_9 = 8\times9^0 + 1\times9^1 + 4\times9^2 + 6\times9^3 + 5\times9^4$

$= (37520)_{10}$

$\therefore$ ~~subtraction verified~~

$\therefore$ Multiplication verified

8] $(01000010)_{1's}$

= As ~~8~~ sign bit is ~~positive~~ 0 the sign of it is positive. As it is in positive ~~format~~ form we do not need to flip any of its ~~bi~~ digits.

= ~~0x~~

$= 0 \times 2^0 + 1 \times 2^1 + 0 \times 2^2 + 0 \times 2^3 + 0 \times 2^4 + 0 \times 2^5$

$+ 1 \times 2^6$

$= (+66)_{10}$

9] $(10111100)_{2's}$

As sign bit is 1 the number is negative. As it is negative we need to ~~define the~~ identify the magnitude of it.

10111100

01000011 ← 1's compliment

+1

$-(01000100)_{2's}$ ← 2's compliment

= As the sign bit is 0 ~~bit as i~~ we can directly convert it to decimal and identify it's magnitude.

$$= -(0\times2^{0}+0\times2^{1}+1\times2^{2}+0\times2^{3}+0\times2^{4}+0\times2^{5}+1\times2^{6})$$

$$= (-68)_{10}$$

10) a) $(91)_{10}$

LSB

2 | 91
2 | 45 − 1
2 | 22 − 1
2 | 11 − 0
2 | 5 − 1
2 | 2 − 1
2 | 1 − 0
0 − 1

MSB

$= (1011011)_2$

As it is 10 bit one's complement

$\therefore (0001011011)_{1's} = (91)_{10}$

As

As for $(499)_{10}$

LSB

2 | 499
2 | 249 − 1
2 | 124 − 1
2 | 62 − 0
2 | 31 − 0
2 | 15 − 1
2 | 7 − 1
2 | 3 − 1
2 | 1 − 1
2 | 0 − 0

MSB

$\therefore (499)_{10} = (111110011)_2$

As it is 10 bit

$\therefore 499 = (0111110011)$

$\therefore$ 0111110011

$\therefore (-499)_{10} = (1000001100)_{1's}$

$(00010110111)_{1's}$
$\underline{(10000001100)_{1's}}$
$(1001100111)_{1's}$

$\therefore (91)_{10} - (499)_{10} = (1001100111)_{1's}$ — ①

As the sign bit of ① is 1 and 91 < 499 and the answer supposed to be 499 is negative, so the answer is negative ~~an~~. As the sign bit of ① is 1 so it is negative number, so there is no overflow

From previous part we get for 1's complement

$(91)_{10} = (0001011011)_{1's}$

$(-499)_{10} = (1000001100)_{1's}$

As $(91)_{10}$ is positive so 1's compliment and 2's complement will be same.

∴ $(91)_{10}$ = (0001011011)2's

As for $(-499)_{10}$ we need to add 1 with the 1's complement to convert it to 2's complement number system.

$$
\begin{array}{rl}
(-499)_{10} = & (10000001100)1's \\
 & \qquad\qquad +1 \\
\hline
 & (10000001101)2's
\end{array}
$$

$$
\begin{array}{l}
(0001011011)2's \\
(1000001101)2's \\
\hline
(1001101000)2's
\end{array}
$$

Ans $(91-499)_{10}$ = (1001101000)2's —⑪

As 91 < 499 and -499 is negative. so the answer of substraction is supposed to be negative. ⑫ As ⑪'s sign bit is 1, which means it is a negative number. So, there is no overflow.

b) $(379)_{10}$

↑ LSB

2 | 379
2 | 189 - 1
2 | 94 - 1
2 | 47 - 0
2 | 23 - 1
2 | 11 - 1
2 | 5 - 1
2 | 2 - 1
2 | 1 - 0
0 - 1

MSB

$(379)_{10} = (101111011)_2$

∴ 10 bit 1's compliment system,

$(379)_{10} = (0101111011)_{1's}$

For $(98)_{10}$

$2 \,|\, 98$

$2 \,|\, 49 - 0$

$2 \,|\, 24 - 1$

$2 \,|\, 12 - 0$

$2 \,|\, 6 - 0$

$2 \,|\, 3 - 0$

$2 \,|\, 1 - 1$

$0 - 1$

↑ LSB

MSB

$\therefore (98)_{10} = (1100010)_2$

∴ 10 bit 1's compliment system

$\therefore (98)_{10} = (0001100010)_{1's}$

$$\therefore \begin{array}{r} (0101111011)_{1's} \\ (0001100010)_{1's} \\ \hline (0111011101)_{1's} \end{array} \quad \text{——} \; ①$$

There is no overflow, because as both. 379, 98 are positive there addition is supposed to be positive and the answer we get from 1's complement ~~is~~ from ① it's sign bit is 0 which means it is positive number. So we can say that there is no overflow.

As both numbers are positive theirs 2's compliment will be same as ones compliment.

$(379)_{10} = (0101111011)_{2's}$

$(98)_{10} \quad (0001100010)_{2's}$

$$\begin{array}{r} (0101111011)_{2's} \\ (0001100010)_{2's} \\ \hline (0111011101)_{2's} \end{array}$$

$(379+98)_{10} = (0111011101)_{2's}$ —— ⑪

There is no overflow, as the ~~answer is~~ 379, 98 both are positive the addition of these two will be positive. ~~A~~ from ⑪ the 2's compliment number addition we get the sign bit of the addition is 0, which means the number is positive in 2's complement. So, ~~the~~ it is correct answer and there is no overflow.

11) Price of 1 8GB DDR4 Ram

$= (1C2)_{16}$

$= 2 \times 16^0 + 12 \times 16^1 + 1 \times 16^2$

$= (450)_{10}$

$\therefore$ Price of 2, 8GB DDR4 Ram

$= 2 \times (450)_{10}$

$= (900)_{10}$

$\therefore$ Price of graphics card RTX is

$= (10010110000)_2$

$= 0 \times 2^0 + 0 \times 2^1 + 0 \times 2^2 + 0 \times 2^3$
$+ 1 \times 2^4 + 1 \times 2^5 + 0 \times 2^6 + 1 \times 2^7$
$+ 0 \times 2^8 + 0 \times 2^9 + 1 \times 2^{10}$

$= (1200)_{10}$

∴ Money my generous friend gave $(4064)_8$ dollar

$= 4\times8^0+6\times8^1+0\times8^2+4\times8^3$

$= (2100)_{10}$

∴ Money will be saved after buying these components $= (2100-1200-900)_{10}$

$=(0)_{10}$

∴ I will have no money left after buying those components.