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) $(11011.101)_2$

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

$= (27.625)_{10}$

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2) $(4195)_{10}$

$= 2 \,|\, 4195$

$2 \,|\, 2097 - 1$

$2 \,|\, 1048 - 1$

$2 \,|\, 524 - 0$

$2 \,|\, 262 - 0$

$2 \,|\, 131 - 0$

$2 \,|\, 65 - 1$

$2 \,|\, 32 - 1$

$2 \,|\, 16 - 0$

$2 \,|\, 8 - 0$

$2 \,|\, 4 - 0$

$2 \,|\, 2 - 0$

$2 \,|\, 1 - 0$

$0 - 1$

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

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

$= 5 + 32$

$= (37)_{10}$

b) $(2173)_8$ 1

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

$= (1147)_{10}$

4) $(513)_{10}$

$=$ 16 | 513
16 | 32 − 1
16 | 2 − 0
0 − 2

$\therefore (201)_{16}$

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 convert 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,

$$
\begin{array}{r|l}
4 & 81906 \\
4 & 20476 - 2 \\
4 & 5119 - 0 \\
4 & 1279 - 3 \\
4 & 319 - 3 \\
4 & 79 - 3 \\
4 & 19 - 3 \\
4 & 4 - 3 \\
4 & 1 - 0 \\
 & 0 - 1
\end{array}
$$

$\therefore (103333302)_4$

$\therefore (10110111)_5 = (103333302)_4$

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
$(56418)_9$

$\therefore$ Base-9

addition $= (546)_9$ —— (i)

Subtraction $= (267)_9$ —— (ii)

Multiplication $= (56418)_9$ —— (iii)

Let us convert base-9 to decimal,

$(412)_9 = 2\times9^0 + 1\times9^1 + 4\times9^2$

$= (335)_{10}$

$(134)_9 = 4\times9^0 + 3\times9^1 + 1\times9^2$

$= (112)_{10}$

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

~~Ba~~ Decimal

addition $= (447)_{10}$

Substraction $= (223)_{10}$

Multiplication $= (37520)_{10}$

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

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

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

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

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

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

From (iii) 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

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

As 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 digits.

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

$+ 1\times2^6$

$= (+66)_{10}$

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

As sign bit is $\underline{1}$ the number is negative.

As it is negative we need to ~~define the~~ identify the magnitude of it.

10111100

01000011 $\leftarrow$ 1's compliment

+1

$-\,(01000100)_{2's} \leftarrow$ 2's compliment

= As the sign bit is 0 ~~bit as~~ 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) $(91)_{10}$

$$
\begin{array}{l|l}
2 & 91 \\
2 & 45 - 1 \\
2 & 22 - 1 \\
2 & 11 - 0 \\
2 & 5 - 1 \\
2 & 2 - 1 \\
2 & 1 - 0 \\
 & 0 - 1
\end{array}
$$

$= (1011011)_2$

As it is 10 bit one's complement

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

As for $(499)_{10}$

$$
\begin{array}{r|l}
2 & 499 \\
2 & 249 - 1 \\
2 & 124 - 1 \\
2 & 62 - 0 \\
2 & 31 - 0 \\
2 & 15 - 1 \\
2 & 7 - 1 \\
2 & 3 - 1 \\
2 & 1 - 1 \\
2 & 0 - \phi
\end{array}
$$

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

As it is 10 bit

$\therefore$ 499 $= (0111110011)$

$\therefore$ 0111110011

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

$(00010110111)_{8's}$

$\underline{(10000001100)_{8's}}$

$(10011001111)_{1's}$

$\therefore (91)_{10} - (499)_{10} = (10011001111)_{1's}$ — 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

$(91)_{10} = (00001011011)_{1's}$

$(-499)_{10} = (10000001100)_{1's}$

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

$\therefore (91)_{10} = (00010110111)_{2's}$

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

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

$$
\begin{array}{r}
(00010110111)_{2's} \\
(10000001101)_{2's} \\
\hline
(10011101000)_{2's}
\end{array}
$$

$\therefore (91-499)_{10} = (10011101000)_{2's}$ —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) $(379)_{10}$

$$
\begin{array}{r|l}
2 & 379 \\
2 & 189 - 1 \\
2 & 94 - 1 \\
2 & 47 - 0 \\
2 & 23 - 1 \\
2 & 11 - 1 \\
2 & 5 - 1 \\
2 & 2 - 1 \\
2 & 1 - 0 \\
 & 0 - 1
\end{array}
$$

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

c.

∴ 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
```

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

∴ 10 bit 1's compliment system

∴ $(98)_{10} = (0001100010)_{1's}$

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

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 (i) it's sign bit is 0 which means it is positive ~~n~~ 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

$(379)_{10} = (01011111011)_{2's}$

$(98)_{10} \quad (00001100010)_{2's}$

$$
\begin{array}{r}
(01011111011)_{2's} \\
(00011000010)_{2's} \\
\hline
(01110111101)_{2's}
\end{array}
$$

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

There is no overflow, as the ~~answer is~~ ~~is~~ 379,98 both are positive the addition of these two will be positive. A~~s~~ 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

$= (10010110000)_2$

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

$= (1200)_{10}$

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

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

$$=(2100)_{10}$$

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

$$=(0)_{10}$$

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