CSE 260 ASSIGNMENT 0

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Sect: 11

ⓐ $(101)_2 = 1\times2^2 + 0\times2^1 + 1\times2^0 = (5)_{10}$

ⓑ $(10111) = 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0 = (47)_{10}$

ⓒ $(00100101)_2 = 0\times2^7 + 0\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0 = (37)_{10}$

ⓓ $(10000101)_2 = 1\times2^7 + 0\times2^6 + 0\times2^5 + 0\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0$

$= (133)_{10}$

ⓔ $(11010011)_2 = 1\times2^7 + 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$

$= (211)_{10}$

2] ⓐ $(67)_{10}$

2	67	
2	33	− 1
2	16	− 1
2	8	− 0
2	4	− 0
2	2	− 0
2	1	− 0
	0	− 1

$\uparrow$

$\therefore (67)_{10} = (1000011)_2$ (Ans)

ⓑ $(33)_{10}$

2	33	
2	16	− 1
2	8	− 0
2	4	− 0
2	2	− 0
2	1	− 0
	0	− 1

$\uparrow$

$\therefore (33)_{10} = (100001)_2$ (Ans)

(c) $(144)_{10}$

$$
\begin{array}{r|l}
2 & 144 \\
2 & 72 - 0 \\
2 & 36 - 0 \\
2 & 18 - 0 \\
2 & 9 - 0 \\
2 & 4 - 1 \\
2 & 2 - 0 \\
2 & 1 - 0 \\
 & 0 - 1
\end{array}
$$

$\therefore (144)_{10} = (10010000)_2$ (Ans)

(d) $(145)_{10}$

$$
\begin{array}{r|l}
2 & 145 \\
2 & 72 - 1 \\
2 & 36 - 0 \\
2 & 18 - 0 \\
2 & 9 - 0 \\
2 & 4 - 1 \\
2 & 2 - 0 \\
2 & 1 - 0 \\
 & 0 - 1
\end{array}
$$

$\therefore (145)_{10} = (10010001)_2$ (Ans)

3) (a) $(13)_8 = 1\times8^1 + 3\times8^0 = (11)_{10}$

(b) $(7434)_8 = 7\times8^3 + 4\times8^2 + 3\times8^1 + 4\times8^0 = (3868)_{10}$

4) (a) $(90)_{10}$

$$\begin{array}{r|l}
8 & 90 \\ \hline
8 & 11 - 2 \\ \hline
8 & 1 - 3 \\ \hline
 & 0 - 1
\end{array} \uparrow$$

$\therefore (90)_{10} = (132)_8$ (Ans)

(b) $(431)_{10}$

$$\begin{array}{r|l}
8 & 431 \\ \hline
8 & 53 - 7 \\ \hline
8 & 6 - 5 \\ \hline
 & 0 - 6
\end{array} \uparrow$$

$\therefore (431)_{10} = (657)_8$ (Ans)

5. (a) $(A7)_{16} = 10\times16^{1} + 7\times16^{0} = (167)_{10}$

(b) $(2EE)_{16} = 2\times16^{2} + 14\times16^{1} + 14\times16^{0} = (750)_{10}$

(c) $(3C2C)_{16} = 3\times16^{3} + 12\times16^{2} + 2\times16^{1} + 12\times16^{0} = (15404)_{10}$

6. (a) $(26)_{10}$

16 | 26
16 | 1 − 10
0 − 1 ↑

$\therefore (26)_{10} = (1A)_{16}$ [Ans]

(b) $(345)_{10}$

16 | 345
16 | 21 − 9
16 | 1 − 5
0 − 1 ↑

$(345)_{10} = (159)_{16}$ [Ans]

(c) $(834)_{10}$

16 | 834
16 | 52 − 2
16 | 3 − 4
0 − 3 ↑

$(834)_{10} = (342)_{16}$ [Ans]

7 (a) $(11010)_2$

Firstly, $(11010)_2 = 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0 = (26)_{10}$

Now,

$$\begin{array}{r|l} 8 & 26 \\ \hline 8 & 3 - 2 \\ \hline & 0 - 3 \end{array} \uparrow$$

$\therefore (11010)_2 = (32)_8$ [Ans]

(b) $(110111111)_2$

Firstly, $(110111111)_2 = 1\times2^8 + 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0 = (447)_{10}$

Now,

$$\begin{array}{r|l} 8 & 447 \\ \hline 8 & 55 - 7 \\ \hline 8 & 6 - 7 \\ \hline & 0 - 6 \end{array} \uparrow$$

$\therefore (110111111)_2 = (677)_8$ [Ans]

8// (a) $(10010)_2$

Firstly,

$$(10010)_2 = 1\times 2^4 + 0\times 2^3 + 0\times 2^2 + 1\times 2^1 + 0\times 2^0 = (18)_{10}$$

Now,

$$\begin{array}{r|l} 16 & 18 \\ \hline 16 & 1 - 2 \\ \hline & 0 - 1 \end{array} \uparrow$$

$\therefore (10010)_2 = (12)_{16}$ [Ans]

(b) $(100101000)_2$

Firstly,

$$(100101000)_2 = 1\times 2^8 + 0\times 10^7 + 0\times 10^6 + 1\times 10^5 + 0\times 2^4 + 1\times 2^3 + 0\times 2^2 + 0\times 2^1 + 0\times 2^0 = (296)_{10}$$

Now,

$$\begin{array}{r|l} 16 & 296 \\ \hline 16 & 18 - 8 \\ \hline 16 & 1 - 2 \\ \hline & 0 - 1 \end{array} \uparrow$$

$\therefore (100101000)_2 = (128)_{16}$ (Ans)

9]

(a) $(314)_5 = 3\times5^2 + 1\times5^1 + 4\times5^0 = (84)_{10}$ (Ans)

(b) $(10111001)_2 = 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2$
$+ 0\times2^1 + 1\times2^0 = (185)_{10}$

Now,

$$\begin{array}{r|l} 4 & 185 \\ \hline 4 & 46 - 1 \\ \hline 4 & 11 - 2 \\ \hline 4 & 2 - 3 \\ \hline & 0 - 2 \end{array} \uparrow$$

$\therefore (10111001)_2 = (2321)_4$ (Ans)

10. (a)

$$
\begin{array}{r}
01110101 \\
+\ 00011101 \\
\hline
10010010
\end{array}
$$

Rule:

A	B	Sum	Carry
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

Verification:

$(01110101)_2 = 0\times2^7 + 1\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0 = (117)_{10}$

$(00011101)_2 = 0\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 1\times2^3 + 1\times2^2 + 0\times2^1 + 1\times2^0 = (29)_{10}$

$(10010010)_2 = 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0 = (146)_{10}$

$\therefore (117)_{10} + (29)_{10} = (146)_{10}$ (Ans)

(b)

$$
\begin{array}{r}
0000\,1101 \\
+\ 1001\,0011 \\
\hline
1010\,0001
\end{array}
$$

<u>Verification:</u>

$$(00001101)_2 = 0\times2^7 + 0\times2^6 + 0\times2^5 + 0\times2^4 + 1\times2^3 + 1\times2^2 + 1\times2^1 + 0\times2^0 = (14)_{10}$$

$$(10010011)_2 = 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 = (147)_{10}$$

$$(10100001)_2 = 1\times2^7 + 0\times2^6 + 1\times2^5 + 0\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0 = (161)_{10}$$

$$\therefore (14)_{10} + (147)_{10} = (161)_{10}$$

11

(A)

$$\begin{array}{r} 10011001 \\ +\ 10111011 \\ \hline 101010100 \end{array}$$

Verification :

$(10011001)_2 = 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 0\times2^1$
$+ 1\times2^0 = (153)_{10}$

$(10111011)_2 = 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0$
$= (187)_{10}$

$(101010100)_2 = 1\times2^8 + 0\times2^7 + 1\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1$
$+ 0\times2^0 = (340)_{10}$

$\therefore (153)_{10} + (187)_{10} = (340)_{10}$ (Ans)

12

(1)
$$\begin{array}{r} 11111010 \\ +\ 10011011 \\ \hline 110010101 \end{array}$$

Verification:

$(11111010)_2 = 1\times2^7 + 1\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 0\times2^0 = (250)_{10}$

$(10011011)_2 = 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 1\times2^1 + 1\times2^0 = (155)_{10}$

$(110010101)_2 = 1\times2^8 + 1\times2^7 + 0\times2^6 + 0\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 0\times2^1 +$

$1\times2^0 = (405)_{10}$

$\therefore \cancel{(250)_{10} + (155)_{10} = (405)_{10}}$

$\therefore (250)_{10} + (155)_{10} = (405)_{10}$ (Ans)

e.

$$
\begin{array}{r}
10111101 \\
-\ 00111011 \\
\hline
01000010
\end{array}
$$

Rule:

A	B	Sub	Carry
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Verification:

$(10111101)_2 = (189)_{10}$

$(00111011)_2 = (59)_{10}$

$(01000010)_2 = (130)_{10}$

Calculating as the same way we did before

$\therefore (189)_{10} - (59)_{10} = (130)_{10}$ (Ans)

f.

$$
\begin{array}{r}
01011010 \\
-\ 00011111 \\
\hline
0111011
\end{array}
$$

Verification:

$(01011010)_2 = (90)_{10}$

$(00011111)_2 = (31)_{10}$

Calculating as the same way we did before

$(0111011)_2 = (59)_{10}$

$\therefore (90)_{10} - (31)_{10} = (59)_{10}$ (Ans)

11. (a) $(426)_8$

$(235)_8$

addition:

$$(426)_8 \; (+) (235)_8 = (663)_8$$

$$8 \,|\, 11$$

$$8 \,|\, 1 - 3$$

$$0 - 1$$

$(13)_8$

Or

substraction:

$$426 - 235 = (171)_8$$

Mutiplication:

$$426 \times 235 = (125176)_8$$

Verification:

$$(426)_8 = 4\times 8^2 + 2\times 8^1 \times 6\times 8^0 = (278)_{10}$$

$$(235)_8 = 2\times 8^2 + 3\times 8^1 \times 5\times 8^0 = (157)_{10}$$

$$\therefore\; (278)_{10} + (157)_{10} = (435)_{10} = (663)_8$$

$$(278)_{10} - (157)_{10} = (121)_{10} = (171)_8$$

$$(278)_{10} \times (157)_{10} = (43646)_{10} = (125176)_8$$

11. (b) $(7012)_8$
$(1136)_8$

Addition:

$$\begin{array}{r} \overset{1}{} \\ (7012)_8 \\ +\ (1136)_8 \\ \hline (10150)_8 \end{array}$$

$$\begin{array}{r|l} 8 & 8 \\ \hline 8 & 1 - 0 \\ \hline & 0 - 1 \end{array}$$

$(10)_8$

Substraction:

$$\begin{array}{r} 7012 \\ -\ 1136 \\ \hline (5654)_8 \end{array}$$

Mutiplication:

$$\begin{array}{r} (7012)_8 \\ (1136)_8 \\ \times \\ \hline (10235654)_8 \end{array}$$

Verification:

$(7012)_8 = (3594)_{10}$

$(1136)_8 = (606)_{10}$

$\therefore (3594)_{10} + (606)_{10} = (10150)_8 = (4200)_{10}$

$(3594)_{10} - (606)_{10} = (5654)_8 = (2988)_{10}$

$(3594)_{10} \times (606)_{10} = (10235654)_8 = (2177964)_{10}$

12) (a) 72B
48

Addition:

$$\begin{array}{rl} \overset{1}{7}2B & (1835) \\ (+)\ 48 & (72 \\ \hline 773 & (1907) \end{array}$$

$$16\underline{|19}$$
$$16\underline{|1-3}$$
$$0-1$$
$$(13)_{16}$$

Subtraction:

$$\begin{array}{rl} 72B & (1835) \\ -\ 48 & (72) \\ \hline 6E3 & (1763) \end{array}$$

Mutiplication:

$$\begin{array}{rl} 72B & (1835) \\ \times\ 48 & (72) \\ \hline 20418 & (132120) \end{array}$$

(b) 65D
23E

Addition:

$$\begin{array}{r} \overset{1}{6}5D\ (1629) \\ +\ 23E\ (574) \\ \hline 89B\ (2203) \end{array}$$

$$\begin{array}{r|l} 16 & 27 \\ \hline 16 & 1-11 \\ \hline & 0-1 \end{array}$$

(1B)

Subtraction:

$$\begin{array}{r} 65D\ (1629) \\ -\ 23E\ (574) \\ \hline 41F\ (1055) \end{array}$$

Mutiplication:

$$\begin{array}{r} 65D\ (1629) \\ \times\ 23E\ (574) \\ \hline E4486\ (935046) \end{array}$$

13. (a) $(23500)_{10}$

2	23500	
2	11750	0
2	5875	0
2	2937	1
2	1468	1
2	734	0
2	367	0
2	183	1
2	91	1
2	45	1
2	22	1
2	11	0
2	5	1
2	2	1
2	1	0
	0	1

$(23500)_{10} = (101101111001100)_2$

1's complement:

1010010000110011

(b) − 12345

2 | 12345
2 | 6172 − 1
2 | 3086 − 0
2 | 1543 − 0
2 | 771 − 1
2 | 385 − 1
2 | 192 − 1
2 | 96 − 0
2 | 48 − 0
2 | 24 − 0
2 | 12 − 0
2 | 6 − 0
2 | 3 − 0
2 | 1 − 1
0 − 1

So binary is $(0011\ 0000\ 0011\ 1001)_2$ and 1's

Complement 1100111111000110 and the (−12345)₂

's (1100111111000110+1)

So, 1100111111000111 (Ans)

14. a) -23_{10}

2 | 23
2 | 11 − 1
2 | 5 − 1
2 | 2 − 1
2 | 1 − 0
0 − 1

00010111 is the binary,

1's Complement; 11101000

∴ 2's " : 11101001

b) -230_{10}

2 | 230
2 | 115 − 0
2 | 57 − 1
2 | 28 − 1
2 | 14 − 0
2 | 7 − 0
2 | 3 − 1
2 | 1 − 1
0 − 1

∴ binary: 000011100110
1's Complement: 111100011001
2's " : 111100011010

15. (a) $(10111100)_2 = 1\times2^8 + 0\times2^7 + 1\times2^6 + 1\times2^5 + 1\times2^4 + 1\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$

$= (377)_{10}$

(b) $(010110111)_2 = 0\times2^8 + 1\times2^7 + 0\times2^6 + 1\times2^5 + 1\times2^4 + 0\times2^3 + 1\times2^2 + 1\times2^1 + 1\times2^0$

$= (183)_{10}$

16.

(a) $422 - 2$

$(422)_{10} = 110100110 \rightarrow$

$(2)_{10} = 10$

17. Each RAM Costs $(1C2)_{16}$ dollars.

so,

$$(1C2)_{16} = 1\times16^2 + 12\times16^1 + 2\times16^0 = (450)_{10}$$

$\therefore$ two ram Costs $= 450\times2 = (900)_{10}$ \$

Graphics Card Costs,

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

$$= (1200)_{10} \text{ dollars.}$$

$\therefore$ total Costs $= 1200 + 900 = (2100)_{10}$ \$

Money I have $= (4064)_8$

$$= 4\times8^3 + 0\times8^2 + 6\times8^1 + 4\times8^0 = (2100)_{10}\$$$

$\therefore$ Money left $= (2100)_{10} - (2100)$ \$

$= 0$ \$ Ans