1)

a) $(32500)_{10} = (0111111011110100)_2$

2	32500	
2	16250	0
2	8125	0
2	4062	1
2	2031	0
2	1015	1
2	507	1
2	253	1
2	126	1
2	63	0
2	31	1
2	15	1
2	7	1
2	3	1
2	1	1
	0	1

b) $(-12345)_{10} = -(0011000000111001)_2$

$= (1100111111000110)_{16}$

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

1| c| $-(2)_{10} = -(10)_2 = -(0000000000000010)_2$

$= (1111111111111101)_{1s}$

2 | 2
2 | 1 0
0 1

2|

a| $120_{10} = (0000000001111000)_{2s}$

2 | 120
2 | 60 0
2 | 30 0
2 | 15 0
2 | 7 1
2 | 3 1
2 | 1 1
0 1

b| $-(12)_{10} = -(0000000000001100)_2$

$= (1111111111110011)_{1s}$

$+1$

$= (1111111111110100)_{2s}$

2 | 12
2 | 6 0
2 | 3 0
2 | 1 1
0 1

c| $-(120)_{10} = -(0000000001111000)_2$ From (2a)

$= (1111111110000111)_{1s}$

$+1$

$= (1111111110001000)_{2s}$

3) a) $(10101010)_{1's}$

$= -(01010101)_2$

$= -(1\times2^6+2^4+2^2+2^0)_{10}$

$= -85$

3) b) $(01000010)_{1's}$

$(01000010)_2$

$= 66$

c) $(11111111)_{1s}$

$= -(00000000)_2$

$= 0$

4) a) $(01010101)_{2s}$

$= (01010101)_2$

$= (2^6+2^4+2^2+2^0)_{10}$

$= (85)_{10}$

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

$= -(01000100)_2$

$= -(2^6+2^2)_{10}$

$= -68$

c) $(11111111)_{2s}$

$= -(00000001)_2$

$= -(2^0)_{10}$

$= -(1)_{10}$

5) a)

$(525)_{10} = (001000001101)_2$

it is same for 1's and 2's

2 | 525
2 | 262 1
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

2 | 321
2 | 160 1
2 | 80 0
2 | 40 0
2 | 20 0
2 | 10 0
2 | 5 0
2 | 2 1
2 | 1 0
0 1

$-(321)_{10} = -(000101000001)_2$

$= (111010111110)_{1s}$

$= (111010111111)_{2s}$

$(001000001101)_{1s}$
$(111010111110)_{1s}$
$\overline{1\,\boxed{0}\,00011001011}$
$+1$
$\overline{(000011001100)_{1s}}$

$(001000001101)_{2s}$
$(111010111111)_{2s}$
$\overline{1\,\boxed{0}\,000011001100}$

$(000011001100)_{2s}$

5) b)

$(753)_{10} = (001011110001)_2$

2 | 753
2 | 376 1
2 | 188 0
2 | 94 0
2 | 47 0
2 | 23 1
2 | 11 1
2 | 5 1
2 | 2 1
2 | 1 0
0 1

$-(864)_{10} = -(001101100000)_2$

$= (110010011111)_{1s}$

$+1$

$(110010100000)_{2s}$

2 | 864
2 | 432 0
2 | 216 0
2 | 108 0
2 | 54 0
2 | 27 0
2 | 13 1
2 | 6 1
2 | 3 0
2 | 1 1
0 1

$(001011110001)_{1s}$
$(110010011111)_{1s}$
$\overline{(111110010000)_{1s}}$

$(001011110001)_{2s}$
$(110010100000)_{2s}$
$\overline{(111110010001)_{2s}}$

5) c)

$(20)_{10} = (000000010100)_2$

2	20	
2	10	0
2	5	0
2	2	1
2	1	0
	0	1

$-(100)_{10} = -(000001100100)_2$

$= (111110011011)_{1s}$

$= (111110011100)_{2s}$

2	100	
2	50	0
2	25	0
2	12	1
2	6	0
2	3	0
2	1	1
	0	1

$$\begin{array}{r} (000000010100)_{1s} \\ (111110011011)_{1s} \\ \hline (111110101111)_{1s} \end{array}$$

$$\begin{array}{r} (000000010100)_{2s} \\ (111110011100)_{2s} \\ \hline (111110110000)_{2s} \end{array}$$

5) d)

$(35)_{10} = 000000100011$

2	35	
2	17	1
2	8	1
2	4	0
2	2	0
2	1	0
	0	1

$-(210) = -(000011010010)_2$

$= (111100101101)_{1s}$

$= (111100101110)_{2s}$

2	210	
2	105	0
2	52	1
2	26	0
2	13	0
2	6	1
2	3	0
2	1	1
	0	1

$$\begin{array}{r} (000000100011)_{1s} \\ (111100101101)_{1s} \\ \hline (111101010000)_{1s} \end{array}$$

$$\begin{array}{r} (000000100011)_{2s} \\ (111100101110)_{2s} \\ \hline (111101010001)_{2s} \end{array}$$

1.8

$-(000001010101)_2$
$=(111110101010)_{1s}$
$=(111110101011)_{2s}$

$-(000000111000)_2$
$=(111111000111)_{1s}$
$=(111111001000)_{2s}$

$-(0000\ 0000\ 0001)_2$
$=(111111111110)_{1s}$
$=(111111111111)_{2s}$

$-(0000\ 0001\ 0000)_2$
$=(1111\ 1110\ 1111)_{1s}$
$=(1111\ 1111\ 0000)_{2s}$

$-(0000\ 0000\ 0000)_2$
$=(1111\ 1111\ 1111)_{1s}$
$=(0000\ 0000\ 0000)_{2s}$

Scanned by CamScanner

1-12

a)

$$\begin{array}{r}(011010)_2\\-(001101)_2\\\hline(001101)_2\end{array}\qquad\begin{array}{r}(011010)_{1s}\\(110010)_{1s}\\\hline001100\\+1\\\hline(001101)_{1s}\\=(001101)_2\end{array}\qquad\begin{array}{r}(011010)_{2s}\\(110011)_{2s}\\\hline(001101)_{2s}\\=(001101)_2\end{array}$$

b)

$$\begin{array}{r}(011010)_2\\-(010000)_2\\\hline(001010)_2\end{array}\qquad\begin{array}{r}(011010)_{1s}\\(101111)_{1s}\\\hline001001\\+1\\\hline(001010)_{1s}\\(001010)_2\end{array}\qquad\begin{array}{r}(011010)_{2s}\\(110000)_{2s}\\\hline(001010)_{2s}\\(001010)_2\end{array}$$

c)

$$\begin{array}{r}(010010)_2\\-\ (010011)_2\\\hline-(000001)_2\end{array}\qquad\begin{array}{r}(010010)_{1s}\\(101100)_{1s}\\\hline(111110)_{1s}\\-(000001)_2\end{array}\qquad\begin{array}{r}(010010)_{2s}\\(101101)_{2s}\\\hline(111111)_{2s}\\-(000001)_2\end{array}$$

Rough

$$\begin{array}{r}010011\\-\ 010010\\\hline000001\end{array}$$

$$\begin{array}{r}110000\\000100\\\hline101100\end{array}$$

d) we have to do this in 7bit

$$\begin{array}{r}0000100\\-0110000\\\hline-0101100\end{array}\qquad\begin{array}{r}(0000100)_{1s}\\(1001111)_{1s}\\\hline(1010011)_{1s}\\-(0101100)_2\end{array}\qquad\begin{array}{r}(0000100)_{2s}\\(1010000)_{2s}\\\hline(1010100)_{2s}\\-(0101100)_2\end{array}$$

1-15

$(8620)_{10}$

$(1000\,0110\,0010\,0000)_{BCD}$

For excess 3

$(8\ 6\ 2\ 0)_{10}$

$11\ \ 9\ \ 5\ \ 3$

$(1011\ 1001\ 0101\ 0011)_{excess\,3}$

$(86\ 20)_{10}$

$(1110\ 1100\ 0010\ 0000)_{2421}$

2	8620	
2	4310	0
2	2155	0
2	1077	1
2	538	1
2	269	0
2	134	1
2	67	0
2	33	1
2	16	1
2	8	0
2	4	0
2	2	0
2	1	0
	0	1

$(8620)_{10} = 10000110101100$

0		0
1		01
2		10
3		11
4		100
5		101
6		110
7		111
8		1000
9		1001
(A)	10	1010
(B)	11	1011
(C)	12	1100
(D)	13	1101
(E)	14	1110
(F)	15	1111

1	0001
2	0010
3	0011
4	0100
5	1011
6	1100
7	1101
8	1110

2.11

$(18)_{10} = (00010010)_2$
$= (00010010)_{1s}$
$= (00010010)_{2s}$

2	18	
2	9	0
2	4	1
2	2	0
2	1	0
	0	1

$(115)_{10} = (01110011)_2$
$= (01110011)_{1s}$
$= (01110011)_{2s}$

2	115	
2	57	1
2	28	1
2	14	0
2	7	0
2	3	1
2	1	1
	0	1

$(79)_{10} = (01001111)_2$
$= (01001111)_{1s}$
$= (01001111)_{2s}$

2	79	
2	39	1
2	19	1
2	9	1
2	4	1
2	2	0
2	1	0
	0	1

$-(49)_{10} = -(00110001)_2$

$= (11001110)_{1s}$

$= (11001111)_{2s}$

2	49	
2	24	1
2	12	0
2	6	0
2	3	0
2	1	1
	0	1

$-(3)_{10}$

2	3	
2	1	1
	0	1

$= -(00000011)_2$

$= (11111100)_{1s}$

$= (11111101)_{2s}$

$-(100)_{10} = -(01100100)_2$

$= (10011011)_{1s}$

$= (10011100)_{2s}$

2	100	
2	50	0
2	25	0
2	12	1
2	6	0
2	3	0
2	1	1
	0	1

2.12

a)

$(11010100)_{2s}$
$(10101011)_{2s}$
$(01111111)_{2s}$

Not Overflow

b)

$(10111001)_{2s}$
$(11010110)_{2s}$
$(10001111)_{2s}$

Not Overflow

c)

$(01011101)_{2s}$
$(00100001)_{2s}$
$(01111110)_{2s}$

Not Overflow

d)

$(00100110)_{2s}$
$(01011010)_{2s}$
$(10000000)_{2s}$

Overflow

2.15

$(61453)_{10}$ = F00D

16	61453	
16	3840	13
16	240	0
16	15	0
	0	15 ↑

2.16

a)

$$\begin{array}{r} 1234 \\ 5432 \\ \hline 6666 \end{array}$$ is true for 7bits and above

b) $41/3 = 13$ is true for 8 base

$(4\times x+1)/3 = (1\times x+3)$

$\Rightarrow 4x+1 = 3x+9$

$\Rightarrow x = 8$

c) $33/3 = 11$ is true for 4bits and above.

$(3\times x+3)/3 = (1\times x+1)$

$\Rightarrow 3x+3 = 3x+3$

d) $23+44+14+32 = 223$

$2x+3+4x+4+x+4+3x+2 = 2x^2+2x+3$

$\Rightarrow 10x+13 = 2x^2+2x+3$

$\Rightarrow 2x^2-8x-10 = 0$

$x = 5$ or $x = -1$

So, the operation is true for 5 base

e) $302/20 = 12.1$

$(3\times x^2+0\times x+2)/(2x) = x+2+x^{-1}$

$\Rightarrow 3x^2+2 = 2x^2+4x+2$

$\Rightarrow x^2-4x = 0$

$x = 4$ or $x = 4$

so, the operation is true for 4bit.

f)

$14 = 5$

$x+4 = 5$

$\Rightarrow x = 1$ So, apparently it seems to be base 1.

But the are of different bases. As it not possible to satisfy this case with 1 base.