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

= $(1100111111000110)_{1s}$

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	10 ↑
	01

2|

a|

$120_{10} = (0000000001111000)_{2S}$

2	120
2	60
2	30
2	15
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

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

$= (111010111110)_{1S}$

$= (111010111111)_{2S}$

$(001000001101)_{1S}$
$(111010111110)_{1S}$
$\overline{1\ 000011001011}$
$+1$
$(000011001100)_{1S}$

$(001000001101)_{2S}$
$(111010111111)_{2S}$
$\overline{1\ 000011001100}$

$(000011001100)_{2S}$

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

$(001011110001)_{1S}$
$(110010011111)_{1S}$
$\overline{(111100100000)_{1S}}$

$(0010\ 1111\ 0001)_{2S}$
$(1100\ 1010\ 0000)_{2S}$
$\overline{(1111\ 1001\ 0001)_{2S}}$

51 c)

$(20)_{10} = (00000010100)_2$

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

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

$= (1111100111011)_{1s}$

$= (1111100111100)_{2s}$

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

$(00000010100)_{1c}$
$(11111001101 1)_{1s}$
$(11111010111 1)_{1s}$

$(00000010100)_{2c}$
$(11111001110 0)_{2s}$
$(11111011000 0)_{2s}$

51 d)

$(35)_{10} = 000000100011$

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

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

$= (1111001011101)_{1s}$

$= (1111001011110)_{2s}$

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

$(000000100011)_{1s}$
$(111100101101)_{1s}$
$(111101010000)_{1s}$

$(000000100011)_{2s}$
$(111100101110)_{2s}$
$(111101010001)_{2s}$

1.8

$-(000001010101)_2$

$=(111110101010)_{1S}$

$=(111110101011)_{2S}$

$-(000000111000)_2$

$=(111111000111)_{1S}$

$=(111111001000)_{2S}$

$-(0000\ 0000\ 0001)_2$

$=(1111\ 1111\ 1110)_{1S}$

$=(1111\ 1111\ 1111)_{2S}$

$-(0000\ 0001\ 0000)_2$

$=(1111\ 1110\ 1111)_{1S}$

$=(1111\ 1111\ 0000)_{2S}$

$-(0000\ 0000\ 0000)_2$

$=(1111\ 1111\ 1111)_{1S}$

$=(0000\ 0000\ 0000)_{2S}$

1-12

a)

$(011010)_2 - (001101)_2 = (001101)_2$

$(011010)_{1s} - (110010)_{1s} = 001100 + 1 = (001101)_{1s} = (001101)_2$

$(011010)_{2s} - (110011)_{2s} = (001101)_{2s} = (001101)_2$

b)

$(011010)_2 - (010000)_2 = (001010)_2$

$(011010)_{1s} - (101111)_{1s} = 001001 + 1 = (001010)_{1s} = (001010)_2$

$(011010)_{2s} - (110000)_{2s} = (001010)_{2s} = (001010)_2$

c)

$(010010)_2 - (010011)_2 = -(000001)_2$

$(010010)_{1s} - (101100)_{1s} = (111110)_{1s} = -(000001)_2$

$(010010)_{2s} - (101101)_{2s} = (111111)_{2s} = -(000001)_2$

Rough

010011
− 010010
000001

110000
000100
101100

d) We have to do this in 7 bit

$0000100 - 0110000 = -0101100$

$(0000100)_{1s} - (1001111)_{1s} = (1010011)_{1s} = -(0101100)_2$

$(0000100)_{2s} - (1010000)_{2s} = (1010100)_{2s} = -(0101100)_2$

1-15

$(8620)_{10}$

$(10000110\ 00100000)_{BCD}$

For excess 3

$(8620)_{10}$

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

$(8620)_{10}$

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

2	8620	$(8620)_{10} = 10000110101100$
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	

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