

COMPUTER ENGINEERING DEPARTMENT**COE-202 – Fundamentals of Computer Engineering (section 02)****Student Name:****Student Number:****On the subject of Machine Representation of Numbers (Lesson 1 5):**

1) (20 points) Given a machine with $n = 4$ bits per register. Complete the following table specifying all possible integer numbers that can be represented using unsigned, signed magnitude, 1's complement, 2's complement system.

Solution:

All possible numbers	Value in designed (+ve or -ve) of represented number			
	Unsigned	Signed-Magnitude	1's Complement	2's Complement
0000	0	0	0	0
0001	1	1	1	1
0010	2	2	2	2
0011	3	3	3	3
0100	4	4	4	4
0101	5	5	5	5
0110	6	6	6	6
0111	7	7	7	7
1000	8	-0	-7	-8
1001	9	-1	-6	-7
1010	10	-2	-5	-6
1011	11	-3	-4	-5
1100	12	-4	-3	-4
1101	13	-5	-2	-3
1110	14	-6	-1	-2
1111	15	-7	-0	-1

On the subject of Complement Arithmetic (Lesson 1 6):

2) (10 points) Using the Radix complement system, compute $(M-N)$ and $(N-M)$, where $M=(072532)_{10}$ and $N=(003250)_{10}$

3) (10 points) Using the diminished Radix complement system, compute $(M-N)$ and $(N-M)$, where $M=(072532)_{10}$ and $N=(003250)_{10}$

Solution:

2) Radix complement system:

$$n = 6, N' = 10^6 - 003250 = 996750, M' = 10^6 - 072532 = 927468;$$

$$M-N = M+N' = 072532 + 996750 = 069282 \text{ and a carry of 1 is discarded.}$$

$$N-M = N+M' = 003250 + 927468 = 930718 - \text{no end carry is generated.}$$

3) Diminished Radix complement system:

$$n = 6, N' = 999999 - 003250 = 996749, M' = 999999 - 072532 = 927467.$$

$$M-N = M+N' = 072532 + 996749 = 069281 \text{ and the carry is 1 - this carry is added to } 069281 \rightarrow \text{final answer} = 069281 + 1 = 069282.$$

$$N-M = N+M' = 003250 + 927467 = 930717 - \text{no end carry is generated.}$$