3 Number Systems

3.1

Convert all the following values into each of: Binary, Octal, Decimal, and Hexadecimal

1. $(01100011)_2$
2. $(0257)_8$
3. $(611)_{10}$
4. $(19F)_{16}$

3.2

Answer the following binary arithmetic questions. All numbers given are in binary. Representations use the number of bits shown. Give your answers in binary.

1. $0101011 + 1101011$
2. $1101 - 1011$
3. $00010100 - 10101000$
4. 1101×1010
5. 11101001×00101001
6. $01001011 \div 00010111$ (report both quotient and remainder)
7. $1011 \div 0101$ (report both quotient and remainder)

3.3

Give the Two's Complement for each of the following 8-bit binary numbers

1. 10000000
2. 10100111
3. 01101011

3.4

Calculate the answers to the following, working with 8-bit signed binary numbers **stored as sign and magnitude**

1. What is the additive inverse of 01101111?
2. $00110001 + 11001101$
3. $10010101 - 00101010$

3.5

Give the greatest common divisor for each of the following pairs of numbers.

1. $(3, 7)$
2. $(14, 39)$
3. $(11, 23)$

3.6

What is the radix complement of the following numbers (assuming representation with the number of digits shown)?

1. $(52342)_{10}$
2. $(00231)_4$
3. $(01FA)_{16}$

3.7

Assume base 32 is written with the alphabet [0-9A-V] Convert $(321223123212)_4$ into base 32

3.8

A 23 digit number in base 536 can store how many different values?

3.9

A web application needs to encode session ids in as few characters as possible. It can safely use numbers and upper and lowercase letters. What is the smallest number of characters that can encode the id 2348923947234?