

COE 202 & EE 200 – Digital Logic Design

Assignment 2: Binary Arithmetic and Codes

1. (2 pts) Bits have no inherent meaning. Given the 16-bit pattern:

1000 1001 0101 0010

What does it represent in decimal, assuming it is a ...

- BCD code?
 - Unsigned integer?
 - Signed integer in sign-magnitude representation?
 - Signed integer in 2's complement representation?
2. (2 pts) Represent the decimal numbers **5964** and **8072** in BCD, and then show the steps necessary to form their sum.
3. (2 pts) Find the Gray code for the hexadecimal digits.

4. (3 pts) Show the characters of the following 7-bit ASCII code:

1000011 1001111 1000101 0100000 0110010 0110000 0110010

Add a parity bit in the leftmost position giving 8-bit characters with odd parity

5. (2 pts) Perform the following binary multiplications:

a) $10101101_2 \times 10000101_2$

b) $10110010_2 \times 11001010_2$

6. (2 pts) Perform the following additions:

a) $10101101_2 + 10000101_2$

b) $A3F0867B_{16} + 751DC3E4_{16}$

7. (4 pts) Perform the following subtractions using the borrow concept, and then do them again by converting the subtraction into addition to the 2's complement.

a) $10101101_2 - 10000101_2$

b) $A3F0867B_{16} - 751DC3E4_{16}$

8. (3 pts) Convert the following signed decimal integers into 2's complement representation using only 8 bits, and then do the addition on the 8-bit binary numbers. Indicate whether or not there is overflow or carry.

a) $(+63) + (+73)$

b) $(-14) + (-75)$

c) $(+82) + (-42)$