

1. [15] Assume each of the following binary numbers is a twos complement (radix complement) representation. Convert each to its decimal equivalent.
 - a) 00111101
 - b) 11111101
 - c) 01101.011
 - d) 11101.011
 - e) 11001.101

2. [15] Write each of the following decimal numbers in binary signed magnitude (SM), ones complement (DRC – diminished radix complement), and twos complement (RC – radix complement) using a word size of 8 bits.
 - a) 29
 - b) 37
 - c) -29
 - d) -37
 - e) -35

3. [15] Perform each of the following arithmetic operations in both decimal and twos complement. Use a word size of 8 bits for the twos complement representations. Use indirect subtraction by addition rather than subtraction for the subtraction problems.
 - a) $11 + 7$
 - b) $12 + (-3)$
 - c) $-18 - (-6)$

4. [5] What is overflow?

5. [5] How do you detect overflow when adding unsigned binary (UB) numbers?

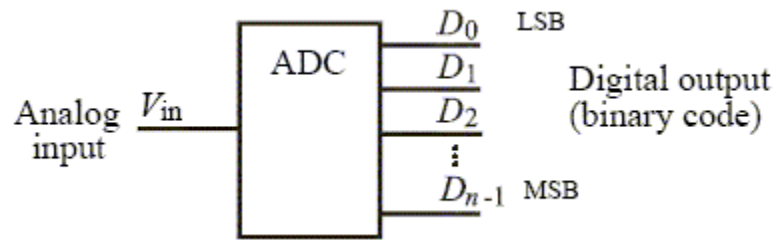
6. [5] How do you detect overflow when adding twos complement (radix complement) numbers?

7. [5] The genius who designed the audio system in my wife's new car used an 8-bit value to store unique folder IDs for playing mp3s from a USB drive. By making this design choice he limited the number of possible folders to how many?

8. [5] Write the binary code and hexadecimal equivalent for the ASCII character 'n'.

9. [5] A block diagram for an analog to digital converter is shown below. The device converts an analog signal (a voltage) on its input into a binary number on its outputs. The resolution of the LSB, the full scale range of the input voltage (V_{FSR}), and the number of bits (n) are related as follows:

Resolution of LSB = $V_{FSR}/2^n$. How many bits are required if the full scale voltage range is 8V and the resolution of the LSB is 4mV?



10. [15] What decimal number is represented by $C21D8000_{16}$ assuming it represents a number in IEEE 754 floating point format? Show your work.