Digital Circuits (2024), Tutorial -3

Question 1: Represent the following numbers using a) Eight-bit two's complement, b)Eight-bit sign magnitude.

1. Sixteen

2. Negative twenty-five

3. One hundred twenty-seven

4. Negative one hundred twenty-seven

5. Negative one hundred twenty-eight

Question 2: Given an eight-bit system using two's complement representation, determine the decimal values for the following binary sequences:

1. 1111 1111

2. 1111 1110

3. 1111 1100

4. 1111 1000

5. 1000 0000

Question 3: Consider the binary pattern 1001. Determine the corresponding decimal values under the following representations:

1. Four-bit unsigned representation

2. Four-bit two's complement representation

3. Four-bit sign magnitude representation

Question 4: For a system using four-bit signed numbers in two's complement representation, compute:

1. 0001 + 1111

2. 0011 + 1111

3. 0011 + 1110

4. `0011 + 1101`

5. `0011 + 1100`

6. `1100 + 0001`

7. `0111 + 0001`

8. `1000 + 1000`

Question 5: For the following signed integer representations using two's complement, determine the range of values that can be represented:

1. Eight-bit signed integers

2. Sixteen-bit signed integers

3. Thirty-two-bit signed integers

4. Sixty-four-bit signed integers

Question 6: Consider a numeric system that uses three symbols: $\{0, 1, 2\}$. Compute the results of the following operations:

1. `11011 + 22010`

2. `111 × 111`

3. `22 × 12`