1.16 Example Problems

Number System Conversions

1. Convert 413.1_5 to unsigned binary. Express the non-integer part exactly, indicating any repeat digits.
2. Express -120_{10} as an 8-bit 2's complement number.
3. Convert 27.77_{10} as an unsigned binary number, rounding the non-integer component to fit into three spaces.
4. Convert $AF013C_{16}$ to a base 4 number.
5. Convert 101101.11_2 to a base 7 number. Express the non-integer part exactly, indicating any repeat digits.

Binary Addition

1. In a 5-bit system, add 15_{10} and -4_{10}. If there is an overflow, indicate how you identified it.
2. In a 5-bit system, add -13_{10} and 5_{10}. If there is an overflow, indicate how you identified it.
3. In a 5-bit system, add -6_{10} and 8_{10}. If there is an overflow, indicate how you identified it.
4. In a 5-bit system, add 12_{10} and 10_{10}. If there is an overflow, indicate how you identified it.
5. In a 5-bit system, add -14_{10} and 7_{10}. If there is an overflow, indicate how you identified it.

Binary Subtraction

1. In a 5-bit system, subtract 10_{10} from -8_{10}. If there is an overflow, indicate how you identified it.
2. In a 4-bit system, subtract -1_{10} from 0_{10}. If there is an overflow, indicate how you identified it.
3. In a 6-bit system, subtract -7_{10} from -24_{10}. If there is an overflow, indicate how you identified it.
4. In a 4-bit system, subtract -5_{10} from 2_{10}. If there is an overflow, indicate how you identified it.
5. In a 4-bit system, subtract -7_{10} from 5_{10}. If there is an overflow, indicate how you identified it.

Binary Multiplication

1. In a 5-bit system, multiply 10_{10} and -3_{10}. If there is an overflow, indicate how you identified it.
2. In a 4-bit system, multiply 2_{10} and -4_{10}. If there is an overflow, indicate how you identified it.
3. In a 5-bit system, multiply 9_{10} and -1_{10}. If there is an overflow, indicate how you identifed it.
4. In a 5-bit system, multiply -8_{10} and 3_{10}. If there is an overflow, indicate how you identified it.
5. In a 6-bit system, multiply -6_{10} and 3_{10}. If there is an overflow, indicate how you identified it.

Binary Codes

1. Express 352_{10} as an 8-4-2-1 BCD number.
2. Express 352_{10} as a 6-3-1-1 BCD number.
3. Look up the ASCII encoding for lowercase q and express as a 7-bit binary number.
4. List the numbers in 4-bit Gray code, in order.
5. Is 2-4-2-1 a complete binary code? If so, list the encodings for numbers zero through nine. If not, which numbers cannot be encoded in this binary code?