4.1 REVIEW OF NUMBER SYSTEMS

Many number systems are in use in digital technology. The most common are the decimal, binary, octal, and hexadecimal systems. The decimal system is clearly the most familiar to us because it is tools that we use every day.

Types of Number Systems are

1. Decimal Number system
2. Binary Number system
3. Octal Number system
4. Hexadecimal Number system

DECIMAL	BINARY	OCTAL	HEXADECIMAL
0	0000	0	0
1	0001	1	1
2	0010	2	2
3	0011	3	3
4	0100	4	4
5	0101	5	5
6	0110	6	6
7	0111	7	7
8	1000	10	8
9	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D

14	1110	16	E
15	1111	17	F

Numbering Systems		
System	Base	Digits
Binary	2	0 1
Octal	8	0 1 2 3 4 5 6 7
Decimal	10	0 1 2 3 4 5 6 7 8 9
Hexadecimal	16	0 1 2 3 4 5 6 7 8 9 A B C D E F

1. **Decimal system**: Decimal system is composed of 10 numerals or symbols. These 10 symbols are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. Using these symbols as digits of a number, we can express any quantity. The decimal system is also called the base-10 system because it has 10 digits. Even though the decimal system has only 10 symbols, any number of any magnitude can be expressed by using our system of positional weighting.

10^3	10^2	10^1	10^0		10^{-1}	10^{-2}	10^{-3}
=1000	=100	=10	=1	•	=0.1	=0.01	=0.001
Most Significant Digit				Decimal point			Least Significant Digit

2. **Binary System:** In the binary system, there are only two symbols or possible digit values, 0 and 1. This base-2 system can be used to represent any quantity that can be represented in decimal or other base system.

2^3	2^2	2^1	2^0		2^{-1}	2^{-2}	2^{-3}
=8	=4	=2	=1	•	=0.5	=0.25	=0.125
Most Significant Digit				Binary point			Least Significant Digit

In digital systems the information that is being processed is usually presented in binary form. Binary quantities can be represented by any device that has only two operating states or possible conditions. E.g.. A switch is only open or closed. We arbitrarily (as we define them) let an open switch represent binary 0 and a closed switch

represent binary 1. Thus we can represent any binary number by using series of switches.

3. Octal System: The octal number system has a base of eight, meaning that it has eight possible digits: 0,1,2,3,4,5,6,7.

8^3	8^2	8^1	8^0		8^{-1}	8^{-2}	8^{-3}
=512	=64	=8	=1	.	=1/8	=1/64	=1/512
Most Significant Digit				Octal point			Least Significant Digit

4. Hexadecimal System: The hexadecimal system uses base 16. Thus, it has 16 possible digit symbols. It uses the digits 0 through 9 plus the letters A, B, C, D, E, and F as the 16 digit symbols.

16^3	16^2	16^1	16^0		16^{-1}	16^{-2}	16^{-3}
=4096	=256	=16	=1	.	=1/16	=1/256	=1/4096
Most Significant Digit				Hexadecimal point			Least Significant Digit