**Summary: Number System**

1. Information should be discrete in order to be analyzed or processed by machines
2. Continuous 🡪 Discrete: Continues entities or quantities should be broken into discrete units like distance to meters, time to hours, image to pixels.
3. Computer systems are members of the Discrete Systems category
4. Quantization: Continuous 🡪 Discrete 🡪 Digits/Numbers/Symbols
5. Base-r number system has r symbols from 0 to r-1
6. Base-r number system has positions with significance based on the powers of r
7. Base-r = Radix-r
8. Base-2 🡪 Binary System
9. Base-4 🡪 Quaternary System
10. Base-8 🡪 Octal
11. Base-10 🡪 Decimal
12. Base-16 🡪 Hexadecimal
13. Base-64 number system has 64 symbols but starts from ‘A’ and ends at ‘/’
14. Any base-r number 🡪 base-10: multiply each digit to the significant of each position which is based on the powers of r. For the integer part: increasing powers of r from 0 to n-1, for the fraction part: decreasing powers of r from -1 to -m.
15. The min in base-r is 00…000. 00…000
16. The min in base-64 is A…AAA.AA…AAA as A has the value of 0
17. The max in base-r with n integer positions and m fraction positions is rn-1.1-r-m
18. Hossein’s number system is not a base-r (radix-r) system for the positions do not have significance!
19. Given an integer number N in base-10, we need logr(N+1) integer positions to show it in base-r