HW1

1. Convert the following numbers from the given base to other three bases listed in the table:

Decimal	Binary	Octal	Hexadecimal
519.67	**?**	**?**	**?**
?	**1001101.011**	**?**	**?**
?	**?**	**74.3**	**?**
?	**?**	**?**	**E0.F**

2. Convert the hexadecimal number E1BF directly to binary number, and then convert it from binary to octal directly.
3. A 12-bit number is 101010110111. What is its content if it represents (a) three decimal digits in BCD? (b) three decimal number in the Excess-3 code?
4. If you have 18 books and want to give each book a unique id with a binary number. If we want to use as least as possible the number of bits as the id, how many bits do you need?
5. Find the Gray code with 12 code numbers.
6. Convert F to the other normal form and standard forms of sum of products and product of sums.

$$F(A, B, C, D) = \sum (0, 1, 3, 5, 7, 9, 13, 14, 15)$$

7. Simplify the following Boolean expressions (do not use K-map) to a minimum number of literals. After simplification, draw the logic diagrams of the circuits that implement the original and simplified expressions, respectively.
   (a) x′y′z+xy′z+xyz+x′yz,
   (b) (y′z+xw′)(xw+y′z).
8. For the function F=x′y′z+xy′z+xyz+x′yz
   (a) Obtain its truth table, (3%)
   (b) Express F in sum-of-minterms and product-of-maxterms forms, (6%)
   (c) Draw the logic diagram of F, (5%)
   (d) Use Boolean algebra to simplify the function F to a new function G, with minimum number of literals, (5%)
   (e) Obtain the truth table of G and compare it with that of F, (5%)
   (f) Draw the logic diagram of G and compare the number of literals of F and G. (5%)

9. For the Gray code with 4 bit ($g_3g_2g_1g_0$), use a 4-bit binary code ($b_3b_2b_1b_0$) as inputs to generate the code
   (a) Derive the related truth table,
   (b) Find the logic functions for each g_i.
10. Use DeMorgan's theorem to remove the complement outside the braces.
   (a) ((x+w')'+w'y'z+(x+z)'(x+y))',
   (b) (x(yz'+y'z)'+wy(y'+x'z))',
   (c) (x+y)'+z'(x'+z)',
   (d) (xy'+z)'(w+y'z).

