Tutorial 1(Extra Questions)

1) What is the largest binary number that can be expressed with 14 bits? What are the equivalent decimal and hexadecimal numbers.

⇒ Binary number:11111111111111

⇒ Hexadecimal : 3FFF

⇒ Decimal:16383

2) Convert 110.010 to hexadecimal and to decimal
   ⇒ Hexadecimal : 6.4
   ⇒ Decimal   : 6.25

3) Simplify each of the following expressions:

   a) [(A+AB') (A+A'B')]+[(CD+C'D')+(C⊕D)]
        ⇒ [(A+AB') (A+A'B')]+1=1

   b) (A' + C + D)(A + B' + C)(B + C)
        ⇒ (A'B'+AD+DB'+C)(B + C)=ABD+C

4) Multiply out to obtain a sum of four terms:
   a) (B' + C + D')(A' + B' + C')(A + B + C)(B + C + D)
        ⇒ (B'A+D'A+D'B+C)(B + C + D)(A' + B' + C')
        ⇒ (D'AB+D'B+C)(A' + B' + C')
        ⇒ (D'B+C)(A' + B' + C')
        ⇒ (A'D'B+BC'D'+A'C+B'C)

   b) (A' + B' + C')(A + C + D')(A + B)(A' + D)(A' + C + D)
        ⇒ (A' + B' + C')(A' + D)(A' + C + D) (A + B)(A + C + D')
        ⇒ (A'+B'D+C'D)(A' + C + D)(A+BC+BD')
        ⇒ (A'+B'DC+B'D+C'D)(A+BC+BD')
        ⇒ (A'+B'D+C'D)(A+BC+BD')
        ⇒ A'BC+A'BD'+AB'D+AC'D

5) Factor AB + A'B' + B'C'D' + BCD' to obtain a product of four terms:
        ⇒ (A'+B)(A+B')+D'(B+C')(B'+C)
        ⇒ [(A'+B)(A+B')+D'][(A'+B)(A+B')+(B+C')(B'+C)]   {Distributive theorem}
        ⇒ (A+B'+D')(A'+B+D')(A'+B+C')(A+1+C')(A'+1+C)(A+B'+C)
        ⇒ (A+B'+D')(A'+B+D')(A'+B+C')(A+B'+C)

6) Simplify $(X \oplus Y)(X \oplus Z) + (X \oplus Y)(Y \oplus Z)$ to obtain a sum of two terms:

$\Rightarrow (X \oplus Y)[(X \oplus Z)+(Y \oplus Z)]$

$\Rightarrow X'YZ+X'YZ'+XY'Z'+XY'Z$

$\Rightarrow X'Y+XY'$

$\Rightarrow X \oplus Y$