TUTORIAL SHEET NO. 2

1. Convert each of the following binary numbers to octal, decimal, and hexadecimal formats.

i. $(111011101.001)_2$ — Ans. $(735.1)_8 = (1DD.2)_{16} = (477.125)_{10}$

ii. $(10101010111)_2$ — Ans. $(2527)_8 = (11367)_{10} = (557)_{16}$

iii. $(111100000)_2$ — Ans. $(740)_8 = (480)_{10} = (1E0)_{16}$

2. Convert each of the following octal numbers to binary, decimal, and hexadecimal formats.

i. $(3754)_8$ — Ans. $(11111101100)_2 = (7EC)_{16} = (2028)_{10}$

ii. $(7777)_8$ — Ans. $(111111111111)_2 = (FFF)_{16} = (4095)_{10}$

iii. $(247.4)_8$ — Ans. $(10100111.100)_2 = (A7.8)_{16} = (167.5)_{10}$

3. Convert each of the following decimal numbers to binary, octal, and hexadecimal formats.

i. $(3479.25)_{10}$ — Ans. $(110110010111.01)_2 = (D97.4)_{16} = (6627.2)_8$

ii. $(642)_{10}$ — Ans. $(1010000010)_2 = (282)_{16} = (1202)_8$

iii. $(555)_{10}$ — Ans. $(1000101011)_2 = (22B)_{16} = (1053)_8$

4. Convert each of the following hexadecimal numbers to binary, octal, and decimal formats.

i. $(4FB2)_{16}$ — Ans. $(100111110110010)_2 = (47662)_8 = (20402)_{10}$

ii. $(88BAE)_{16}$ — Ans. $(10001000101110101110)_2 = (2105656)_8 = (560046)_{10}$

iii. $(DC4.7)_{16}$ — Ans. $(110111000100.0111)_2 = (6704.34)_8 = (3524.4375)_{10}$

5. Perform each of the addition operations indicated below.

i. $(1001011)_2 + (11101)_2$ — Ans. $(1101000)_2$

ii. $(4556)_8 + (1245)_8$ — Ans. $(6023)_8$

iii. $(BCD)_{16} + (A34)_{16}$ — Ans. $(1601)_{16}$

6. Form the two's complement of each of the following binary numbers.

i. $(111011101110)_2$ — Ans. 000100010010

ii. $(111111111000100)_2$ — Ans. 00000000111100

iii. $(100000000)_2$ — Ans. 100000000

iv. $(1010101010111)_2$ — Ans. 0101010101001

7. Perform each of the subtraction using two's complement.

i. $(100101)_2 - (11011)_2$ — Ans. $(001010)_2$

ii. $(1101011)_2 - (111010)_2$ — Ans. $(0110001)_2$

iii. $(1110111)_2 - (10110111)_2$ — Ans. $(1000000)_2$

8. Simplify the following:

    i. $XY+XYZ+XYZ'+X'YZ=Y(X+Z)$

    ii. $A'B'C'+A'BC'+A'BC=A'(C'+B)$

    iii. $A'BC'D+A'BCD+ABD=BD$

    iv. $A+A'B+AB'=A+B$

    v. $AB+(AC)'+AB'C(AB+C)=1$

    vi. $AB+AB'A+AB'C=(A+B)$ A

    vii. $AB'C'+AB'C'D+AC'=AC'$

    viii. $(A+B)(AC+C)(B+AC)'=A'B$

    ix. $AB+AC+ABC(AB+C)=1$

    x. $C(B+C)(A+B+C)=C$

    xi. $(A+B)(A+B')(A'+B)=AB$

    xii. $A+AB+AB'C=A$

9. Realize XOR and XNOR gate using

    i.   NAND gate only

    ii.   NOR gate only

10. Find the complement

    i. $Y=AB'C+A'B'C'$

    ii. $Y=A(BC+B'C')$

11. Design a logic circuit using basic gates only, using NAND gates only and using NOR gates only

    i. $Y=(A+B+C'D)+A'BC'$

    ii. $Y=ABC+B'C+CD$

    iii. $Y=(A+B)(A+C'+D)+(B'+C)$

12. Convert the following into canonical form and write their minterms and maxterms

    i. $AB+BC$

    ii. $AB+ABC+BCD$

    iii. $(A+B)(B+C)$

    iv. $(A+C'+D)(A+B)(C'+D)$

13. Develop the truth table of the following function

    i. $F=AB+AB'+B'C$

    ii. $AB+BC'D+A'D$