

TUTORIAL SHEET NO. 2

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

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| 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.

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| i. $(3754)_8$ | Ans. $(11111101100)_2 = (7EC)_{16} = (2028)_{10}$ |
| ii. $(7777)_8$ | Ans. $(11111111111)_2 = (FFF)_{16} = (4095)_{10}$ |
| 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.

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| 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.

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|---------------------|---|
| 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.

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| 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.

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|--------------------------|-----------------------|
| i. $(111011101110)_2$ | Ans. 000100010010 |
| ii. $(11111111000100)_2$ | Ans. 00000000111100 |
| iii. $(100000000)_2$ | Ans. 10000000 |
| iv. $(1010101010111)_2$ | Ans. 0101010101001 |

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

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|-----------------------------------|--------------------|
| 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. $\overline{AB} + (AC)' + AB'C(AB + C) = 1$
- vi. $AB + AB'A + AB'C = \overline{A + B}$ ~~$A + B$~~
- 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. $\overline{Y} = A(BC + B'C')$

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

13. Develop the truth table of the following function

- i. $F = AB + AB' + B'C$
- ii. $AB + BC'D + A'D$