Tutorial – 9 (Questions)

1. Design and Implement a 4-bit binary-to-gray code converter.

2. Design and Implement a 4-bit gray-to-binary code converter.

3. A safe has 5 locks v, w, x, y and z; all of which must be unlocked for the safe to open. The keys to the locks are distributed among 5 executives in the following manner.

    Mr. A has keys for locks v and x.
    Mr. B has keys for locks v and y.
    Mr. C has keys for locks w and y.
    Mr. D has keys for locks x and z.
    Mr. E has keys for locks v and z.
    Mr. A has keys for locks v and x.

    a. Determine the minimal number of executives required to open the safe.
    b. Find all the combinations of executives that can open the safe; write an expression f(A, B, C, D, E) which specifies when the safe can be opened as a function of what executives are present?
    c. Who is essential executive?

4. The input to computer circuit are the 4-bits of the binary number $A_3A_2A_1A_0$. The circuit is required to produce a 1 if and only if all of the following conditions hold.
    a. The MSB is a 1 or any of the other bits are a 0.
    b. A_2 is a 1 or any of the other bits are a 0.
    c. Any of the 4 bits are a 0.

    Obtain a minimal expression.

5. You are presented with a set of requirements under which an insurance policy can be issued. The applicant must be:
    a. A married female 25 years old or over, or
    b. A female under 25, or
    c. A married male under 25 who has not been involved in a car accident, or
    d. A married male who has been involved in a car accident, or
    e. A married male 25 years or above who has not been involved in a car accident.

    Find the algebraic expression which assumes a value 1 whenever the policy is issued.
    Simplify the expression obtained.