Neelkanth Institute of Technology, Meerut
Electronics and Communication Department

SWITCHING THEORY & LOGIC DESIGN
ASSIGNMENT 1

Question 1:- Design a 4 bit binary to BCD Converter & BCD to Binary converter.
Question 2:- Write a short note on Hamming encoding and decoding process. How a two bit error can detected using Hamming concept. And also determine how can you determine the length of the code.
Question 3:- Do it:-

Implement the Boolean function

$$F = xy + x'y' + y'z$$

(a) With AND, OR, and inverter gates
(b)* With OR and inverter gates
(c) With AND and inverter gates
(d) With NAND and inverter gates
(e) With NOR and inverter gates

The logical sum of all minterms of a Boolean function of n variables is 1.
(a) Prove the previous statement for $n = 3$.
(b) Suggest a procedure for a general proof.

Express the complement of the following functions in sum-of-minterms form:
(a) $F(A,B,C,D) = \sum(2, 4, 7, 10, 12, 14)$
(b) $F(x, y, z) = \prod(3, 5, 7)$

Convert each of the following to the other canonical form:
(a) $F(x, y, z) = \sum(1, 3, 5)$
(b) $F(A, B, C, D) = \prod(3, 5, 8, 11)$

Express the following function as a sum of minterms and as a product of maxterms:

$$F(A, B, C, D) = B'D + A'D + BD$$

Simplify the following Boolean functions:
(a)* $F(A, B, C, D) = \Pi(1, 3, 5, 7, 13, 15)$
(b) $F(A, B, C, D) = \Pi(1, 3, 6, 9, 11, 12, 14)$

Simplify the following expressions to (1) sum-of-products and (2) products-of-sums:
(a)* $x'z' + y'z' + yz' + xy$
(b) $ACD' + C'D + AB' + ABCD$
(c) $(A' + B + D')(A' + B' + C')(A' + B' + C)(B' + C + D')$
(d) $BCD' + ABC' + ACD$

Draw a NAND logic diagram that implements the complement of the following function:

$$F(A, B, C, D) = \Sigma(0, 1, 2, 3, 6, 10, 11, 14)$$