1. [8%] Find the following results.
   (a) Convert 51.375 to binary and to hexadecimal.
   (b) Convert (10110.0101)₂ to decimal and hexadecimal.
   (c) Convert (EA)₁₆ to binary and decimal.
   (d) Find the 1’s and 2’s complements of the binary results of (c)

2. [8%] Add and multiply the following numbers without converting them to decimal.
   (a) Binary numbers 1011 and 101.
   (b) Hexadecimal numbers 2E and 34.

3. [12%] Given the Boolean function \( F = xy + yz + x'z \).
   (a) Express \( F \) in sum of minterms and product of maxterms.
   (b) Implement the simplified \( F \) using NAND gates.

4. [10%] What are the two degenerate two-level forms that can reduce to a single NAND operation? Draw and show the corresponding circuits.

5. [20%] Simplify the following Boolean functions in (1) sum of products and (2) product of sums:
   (a) \( F(A, B, C, D) = AC' + B'D + A'CD + ABCD \)
   (b) \( F(A, B, C, D) = \Sigma(0, 1, 2, 5, 8, 9, 10) \)

6. [15%] A combinational circuit is defined by the following three Boolean functions:
   \[ F_1 = x'y'z + xz \quad F_2 = xy'z' + x'y \quad F_3 = x'y'z + xy \]
   Design the circuit with a decoder and external gates.

7. [15%] Construct a 16x1 multiplexer with two 8x1 and one 2x1 multiplexers. Use block diagrams.

8. [12%] Implement the following Boolean function with a multiplexer:
   \( F(A, B, C, D) = \Sigma(0, 1, 3, 4, 8, 9, 15) \)