

CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT

SCHOOL OF ENGINEERING & TECHNOLOGY

VLSI DESIGN

Assignment-1

Date of submission: On or before First Internal

SEM: CBCS

Short Questions:-

1. Binary number system is used in digital electronics circuits. Why octal, decimal or hexadecimal number systems are not used in circuit levels?
2. What will be the correct answer during subtraction of unsigned numbers using 1's complement method for the following? Mention whether the answer is a positive number or a negative number.
 - End carry occurs.
 - End carry does not occur.
3. What is "prime implicant"? When it is said to be essential?
4. Convert the following function to "product of sums".
$$F = A'B'C + AB'C' + AB'C + ABC' + ABC$$
5. Are "NOR-OR" and "OR-NAND" functions equivalent? Justify.
6. Obtain the truth table of the following functions and express in sum-of-min terms and product-of-max terms.
$$(XY + Z)(Y + XZ)$$
7. Find the complement of $F = X + YZ$; then find the values of F , F' AND $F + F'$.
8. carry out the following addition:
 - a. (+13, -11) using 1's complement notation.
 - b. (-15, +9) using 2's complement notation.
9. Add the following using signed magnitude system.

+8 & +14	+8 & -14
-8 & +14	-8 & +14
10. What is the range of unsigned decimal values that can be represented by 8 bits?
11. How many bits are required to represent decimal values ranging from 75 to -75?
12. Apply Demorgan's theorem to prove that
$$AB + CD + EF = (A + B)(C + D)(E + F)$$
13. Give the truth-table of a function $f(x,y)$ where $f(x,y) = 1$ when $x = y$.
14. Implement with Two-level NOR gate circuit $F(w, x, y, z) = \Sigma(5, 6, 9, 10)$

15. Draw a multi level NAND gate circuit $(AB' + CD')(E+BC) (A+B)$

Long questions:-

- Simplify the Boolean function using four variable maps:
 - $F(w, x, y, z) = \sum (1, 4, 5, 6, 12, 14, 15)$
 - $F(a, b, c, d) = \sum (0, 1, 2, 4, 5, 7, 11, 15)$
 - $F(w, x, y, z) = \sum (0, 2, 4, 5, 6, 7, 8, 10, 13, 15)$
- Use karnough map to reduce $A + BC + CD$ to a minimum SOP form.
- Express the Boolean functions as a sum-of-min terms.
 $F = A + B'C$
 Now convert the sum-of-min terms to another canonical form.
- Simplify the following Boolean function and draw a circuit to represent the function.
 $F(W, X, Y, Z) = \sum 0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14$
- Implement the following function.
 - $F = A(CD+B) + BC'$ using NAND gates.
 - $F = (A+B)(C+D)E$ using NOR gates.
- Using karnough map convert the following standard POS expression into a minimum POS expression, a standard SOP expression and a minimum SOP expression:
 $(A + B' + C' + D')(A' + B' + C + D)(A' + B' + C' + D)(A + B + C + D)$
- Use Karnough map to simplify the expression to a minimum SOP form:
 $A'B'C' + A'BC' + AB'C' + ABC'$
- Simplify the following expression:

(A) $AB + A(B + C) + B(B + C)$ (B) $F = \sum m(1, 3, 5, 7)$

(C) $F = \prod M(3, 5, 7)$ (D) $F = (A + B + C + D) + ABCD$

(E). Show that $AB+AB'C+BC = AC+BC'$
- Minimize the function
 $F(W, X, Y, Z) = \sum (0, 1, 2, 3, 8, 9, 10, 11)$
- Find the complement of the following

(A) $F = ABC + A'BC'$ (B) $F = B(AC + AC)$

(D) Convert the given expression into canonical SOP form:

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

(F) .Simplify the Boolean expression in (1) sum of product & (2) products of sum

(G) $XZ + YZ + YZ + XY'$

(H) $(A + B + D)(A + B + C')(A + B + D)(B + C + D)$