National University

of Computer and Emerging Sciences Chiniot -Faisalabad Campus

EE1005 – Digital Logic Design
Quiz# 1

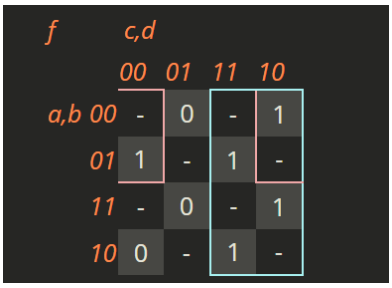
Instructor: Muhammad Adeel Tahir **Section:** CS – 3N **Time:** 20 Minutes
Name: _____
Total Marks: 15 marks **Roll Number:** | 2 | | | - | | | | |

Instruction: Cuttings will lead to deductions in each part, use a rough sheet for your rough work.

Question 1: A circuit takes four inputs**:** $a, b, c, and\ d$.The three inputs $a, b, and\ c$ represent the binary digits of the number (0-7), with a being the most significant bit. d is an odd-parity bit, meaning it ensures that the total number of 1s $in\ a, b, c, and\ d$ is always **odd**. The circuit outputs 1 if the input **number is** a **prime** number, and 0 otherwise. A prime number is a number divisible only by itself and 1. 1 is considered prime, but 0 is not. Apply don't care carefully.

Implement the truth table for the above circuit **[5 marks]**
Implement the K-map for the truth table **[3 marks]**
Write the final simplified expression obtained from the k map. **[2 marks]**
Note: No cutting is allowed, it will be marked as wrong in case of cutting.

a	b	c	d	Output
0	0	0	0	x
0	0	0	1	0
0	0	1	0	1
0	0	1	1	x
0	1	0	0	1
0	1	0	1	x
0	1	1	0	x
0	1	1	1	1
1	0	0	0	0
1	0	0	1	x
1	0	1	0	x
1	0	1	1	1
1	1	0	0	x
1	1	0	1	0
1	1	1	0	1
1	1	1	1	x



f(a, b, c, d) = a'd' + c

For Rough Work Only (will not be checked)

Outputs:
1: The combination has an odd number of 1s and the 3-bit number (a, b, c) is prime.
0: The combination has an odd number of 1s but the 3-bit number (a, b, c) is not prime.
X(Don't care): The combination does not have an odd number of 1s (don't care condition).
Total Combinations: 16
Outputs is 1: Combinations where there is an odd number of 1s and the 3-bit number (a, b, c) is prime.
Outputs is 0: Combinations with an odd number of 1s but the 3-bit number (a, b, c) is not prime.
Outputs is Don't Care : All other combinations (even number of 1s).

Prime Number Check: The number represented by (a, b, c) (interpreted as a 3-bit binary number) must be one of [1, 2, 3, 5, 7], where 1 is considered prime and 0 is not prime.

Question 2: **[5 marks]**

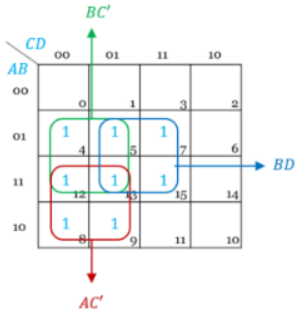
Given the following Function F, perform the following parts carefully.

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

Note: No cutting is allowed, it will be marked as wrong in case of cutting.

a) Write down the min terms for function G that is the complement of the above function F:
$G(A, B, C, D) = 4,5,7,8,9,12,13,15$

b) Plot G on K-map, write the final equation obtained from it: AC'+BC'+BD



Rough Work Only: