

INDRAPRASTHA INSTITUTE OF INFORMATION TECHNOLOGY DELHI

ECE111: Digital Circuits

Quiz 1

Date: February 6, 2022

Note:-

1. The exam will start at 12:00 p.m
2. After 12:20 p.m, start submitting the same on the classroom.
3. Any submission after 12:30 p.m will be counted under late submission, with 1 mark as penalty for each minute till 12:35 p.m.
4. All submission after 12:35 p.m will be graded zero.

1. Implement the following functions using minimum number of 2-input NOR gates. You can use axioms, , postulates and expression mentioned below and the DeMorgan's law and any other Theorem to simplify the expression. You can also use associativity of XOR operation.

a. $f(x, y, z) = (x \cdot z) \oplus [(x + y) \cdot z] \oplus [(x + y) \cdot (x + \bar{y}) \cdot (\overline{x \cdot \bar{z}})]$

b. $f(x, y, z) = z \cdot \bar{y} \oplus x \cdot \bar{y} \oplus (\bar{x} + y) \oplus y \cdot \bar{x} \oplus \bar{z} \cdot \bar{y}$

Axioms, Postulates and Logical Expression:

- $0 \cdot 0 = 0, 1 \cdot 1 = 1, 0 \cdot 1 = 1 \cdot 0 = 0$
- $0 + 0 = 0, 1 + 1 = 1, 0 + 1 = 1 + 0 = 1$
- $x + 0 = x, x \cdot 1 = x$
- $x \cdot y = y \cdot x, x + y = y + x$
- $x \cdot (y + z) = x \cdot y + x \cdot z$
- $x + (y \cdot z) = (x + y) \cdot (x + z)$
- $x \cdot \bar{x} = 0, x + \bar{x} = 1$
- $x \oplus y = \bar{x} \cdot y + x \cdot \bar{y}$