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Quiz 1 Digital Logic Design 8+4+3

1.A company uses a digital **safe access control system** built using logic gates.
There are **three conditions (inputs):**
A → Employee has entered the correct PIN (1 = correct, 0 = wrong)

B → Employee ID card is detected (1 = detected, 0 = not detected)

C → Security override key is active (1 = active, 0 = inactive)

The **safe door should open (Output = 1) only** when:
The correct PIN **and** ID card are both valid, **or**

The **security override key** is active **but** no wrong PIN attempt is made (i.e., PIN input = 0 doesn't cause override opening).

1. Write the Boolean expression for the system.
2. Simplify it using Boolean laws.
3. Draw the logic diagram using basic gates (AND, OR, NOT).
4. Create a truth table.
5. Explain one situation where the logic might **fail or be tricked** if an input sensor is faulty.

2.Convert **$(111011.101)_2$** to **decimal.**

Convert **$(126)_{10}$** to **binary,** then from that binary to **hexadecimal.**

3.Simplify the boolean Expresions:

1.A + B')·(A' + B)

2.A·B + A·C + B·C

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