1.State and prove de Morgan's laws of Boolean algebra .also simplify the Boolean expression [(X.Y`).(z+y.w)+x`.y`).z].

De Morgan's Laws:

De Morgan's Laws in Boolean algebra describe the relationships between negation of a conjunction (AND) and disjunction (OR), and vice versa. There are two laws:

1. **First Law (De Morgan's Law for Negation of Conjunction):**

\[\overline{A \cdot B} = \overline{A} + \overline{B} \]

2. **Second Law (De Morgan's Law for Negation of Disjunction):**

\[\overline{A + B} = \overline{A} \cdot \overline{B} \]

Proof of De Morgan's Laws:

1. **First Law Proof:**

\[\overline{A \cdot B} = 1 – (A \cdot B) = (1 – A) + (1 – B) = \overline{A} + \overline{B} \]

2. **Second Law Proof:**

\[\overline{A + B} = 1 – (A + B) = (1 – A) \cdot (1 – B) = \overline{A} \cdot \overline{B} \]

Simplification of the Boolean Expression:

Let's simplify the given Boolean expression \([(X \cdot \overline{Y}) \cdot (Z + Y \cdot W) + \overline{X} \cdot \overline{Y} \cdot \overline{Z}]\):

\[[(X \cdot \overline{Y}) \cdot (Z + Y \cdot W) + \overline{X} \cdot \overline{Y} \cdot \overline{Z}] \]

Apply distributive law:

\[(X \cdot \overline{Y} \cdot Z + X \cdot \overline{Y} \cdot Y \cdot W + \overline{X} \cdot \overline{Y} \cdot \overline{Z}) \]

Simplify terms:

$$ (X \cdot \overline{Y} \cdot Z + 0 + \overline{X} \cdot \overline{Y} \cdot \overline{Z}) $$

Combine terms:

$$ X \cdot \overline{Y} \cdot Z + \overline{X} \cdot \overline{Y} \cdot \overline{Z} $$

The simplified Boolean expression is $X \cdot \overline{Y} \cdot Z + \overline{X} \cdot \overline{Y} \cdot \overline{Z}$.