

Simplify the following by Boolean Algebra,

② $[H \vee (W \& M)] \& -W$ S. Choudhury,

সম্পূর্ণ আকারে প্রকাশ করে পাও —

$$\begin{aligned}
 & [x + (y \cdot z)] \cdot (-y) \\
 &= [(x+y) - (x+z)] \cdot (-y) \\
 &= -y \cdot [x + (y \cdot z)] \\
 &= (-y \cdot x) + [-y \cdot (y \cdot z)] \\
 &= (-y \cdot x) + [(-y \cdot y) \cdot z] \\
 &= (-y \cdot x) + (0 \cdot z) \\
 &= (-y \cdot x) + 0 \\
 &= -y \cdot x \\
 &= x \cdot -y
 \end{aligned}$$

$[H \vee (W \& M)] \& -W$

[প্রকৃত বিবৃতি]

- $\Leftrightarrow -W \& [H \vee (W \& M)]$ - By commutation.
- $\Leftrightarrow (-W \& H) \vee [-W \& (W \& M)]$ - By distribution.
- $\Leftrightarrow (-W \& H) \vee [(-W \& W) \& M]$ - By Association.
- $\Leftrightarrow (-W \& H) \vee (-W \& W)$ - By contradictory disjunct conjunct dropped.
- $\Leftrightarrow -W \& H$ - By contradictory disjunct dropped.
- $\Rightarrow H \& -W$ - by comm.

③ $(A \& B) \vee (A \& -B) \vee (-A \& B)$

সম্পূর্ণ আকারে প্রকাশ করে পাও —

$$\begin{aligned}
 & (x \cdot y) + (x \cdot -y) + (-x \cdot y) \\
 &= [x \cdot (y + -y)] + (-x \cdot y) \\
 &= [x \cdot 1] + (-x \cdot y) \\
 &= x + (-x \cdot y) \\
 &= (x + -x) \cdot (x + y) \\
 &= 1 \cdot (x + y) \\
 &= x + y.
 \end{aligned}$$

[প্রকৃত বিবৃতি]

- $(A \& B) \vee (A \& -B) \vee (-A \& B)$
- $\Leftrightarrow [A \& (B \vee -B)] \vee (-A \& B)$ - By distribution
- $\Leftrightarrow [A \vee (-A \& B)]$ - By tautology conjunct dropped.
- $\Leftrightarrow (A \vee -A) \& (A \vee B)$ - By distribution.
- $\Leftrightarrow A \vee B$ - By tautology conjunct dropped.

$$(g) (A \& B) \vee (A \& \neg B) \vee (\neg A \& B) \vee (\neg A \& \neg B)$$

বুলীয়-আকারে প্রকাশ করে পাই -

$$\begin{aligned} & (x \cdot y) + (x \cdot \neg y) + (\neg x \cdot y) + (\neg x \cdot \neg y) \\ &= [x \cdot (y + \neg y)] + [\neg x \cdot (y + \neg y)] \\ &= (x \cdot 1) + (\neg x \cdot 1) \\ &= x + \neg x \\ &= 1 \end{aligned}$$

$$(A \& B) \vee (A \& \neg B) \vee (\neg A \& B) \vee (\neg A \& \neg B) \quad (\text{প্রমাণ নিন})$$

$$\Leftrightarrow [A \& (B \vee \neg B)] \vee [\neg A \& (B \vee \neg B)] \quad \text{- By distribution.}$$

$$\Leftrightarrow A \vee \neg A \quad \text{- By tautology disjunct dropped.}$$

$$(h) (A \vee B) \& (A \vee \neg B) \& \neg A$$

বুলীয়-আকারে প্রকাশ করে পাই -

$$\begin{aligned} & (x + y) \cdot (x + \neg y) \cdot \neg x \\ &= [x + (y \cdot \neg y)] \cdot \neg x \\ &= (x + 0) \cdot \neg x \\ &= x \cdot \neg x \\ &= 0 \end{aligned}$$

$$(A \vee B) \& (A \vee \neg B) \& \neg A \quad (\text{প্রমাণ নিন})$$

$$\Leftrightarrow [A \vee (B \& \neg B)] \& \neg A \quad \text{- By distribution.}$$

$$\Leftrightarrow A \& \neg A \quad \text{- By contradictory disjunct dropped.}$$

$$(1) \quad \neg (A \& \neg (A \& \neg (A \& B)))$$

बुनियादी तथ्यांशानुसार प्रमाण करणे गरजेचे आहे -

$$\begin{aligned} & \neg [x \cdot \neg \{x \cdot \neg (x \cdot y)\}] \\ = & \neg [x + \neg \neg \{x \cdot \neg (x \cdot y)\}] \\ = & \neg x + \{x \cdot \neg (x \cdot y)\} \\ = & \neg x + \{x \cdot (\neg x + \neg y)\} \\ = & \neg x + \{(x \cdot \neg x) + (x \cdot \neg y)\} \\ = & \neg x + \{0 + (x \cdot \neg y)\} \\ = & \neg x + (x \cdot \neg y) \\ = & (\neg x + x) \cdot (\neg x + \neg y) \\ = & 1 \cdot (\neg x + \neg y) \\ = & \neg x + \neg y. \end{aligned}$$

$$\neg [A \& \neg \{A \& \neg (A \& B)\}]$$

[प्रमाणित]

$$\Leftrightarrow \neg [A \vee \neg \neg \{A \& \neg (A \& B)\}] \quad \text{By De.M.}$$

$$\Leftrightarrow \neg A \vee \{A \& \neg (A \& B)\} \quad \text{By D.D.}$$

$$\Leftrightarrow \neg A \vee \{(A \& \neg A) \& B\} \quad \text{By Association.}$$

$$\Leftrightarrow \neg A \vee \{A \& (\neg A \vee \neg B)\} \quad \text{By Distribution.}$$

$$\Leftrightarrow \neg A \vee \{(A \& \neg A) \vee (A \& \neg B)\} \quad \text{By Distribution.}$$

$$\Leftrightarrow \neg A \vee (A \& \neg B) \quad \text{By contradictory disjunct dropped.}$$

$$\Leftrightarrow (\neg A \vee A) \& (\neg A \vee \neg B) \quad \text{By Distribution.}$$

$$\Leftrightarrow \neg A \vee \neg B \quad \text{By tautology conjunct dropped.}$$