S. Chowdhury.

— 1 —

Exercise

2.1

$A \vee (A \& B)$, $A \& (A \vee B)$, A

A	v	(A & B)		
t	t	t	t	t
f	f	f	f	t
t	t	t	f	f
f	f	f	f	f

A	&	(A v B)		
t	t	t	t	t
f	f	f	t	t
t	t	t	t	f
f	f	f	f	f

A
t
f
t
f

সত্যসারণী পদ্ধতির সাহায্যে প্রমানিত হল যে, উপরিউক্ত বাক্য তিনটি যৌক্তিক ভাবে সমমান সম্পন্ন।

2.2

$(A \vee B) \& (C \vee D)$, $(A \& C) \vee (B \& C) \vee (A \& D) \vee (B \& D)$

$(A \vee B) \& (C \vee D)$

$\leftrightarrow [(A \vee B) \& C] \vee [(A \vee B) \& D]$ – By distribution.

$\leftrightarrow [C \& (A \vee B)] \vee [D \& (A \vee B)]$ – By commutation.

$\leftrightarrow [(C \& A) \vee (C \& B)] \vee [(D \& A) \vee (D \& B)]$ – By Distribution.

$\leftrightarrow (A \& C) \vee (B \& C) \vee (A \& D) \vee (B \& D)$ – By commutation. উপরিউক্ত দুটি বাক্য

Dist এবং comm এই দুটি সূত্রের দ্বারা প্রমানিত হল যে

পরস্পর যৌক্তিক সমমানসম্পন্ন

2.3

a) $(M \& C) \vee -C$

b) $C \vee (C \& M)$

c) $M \vee (-M \& -C)$

d) $M \vee -C \vee (C \& M)$

e) $-(M \& C) \& (-M \vee -C)$

f) $(M \& C) \vee (M \& -C)$

g) $[(M \& C) \vee (-M \& -C)] \& (M \& C)$

h) $-(M \& C) \vee -(-M \& -C)$

2.4

a) → করার দরকার নেই (কেন)

b) $[H \vee (M \& C)] \& -C$

c) $[H \vee \{(M \& C) \vee (-M \& -C)\}] \& C$

Simpler

2.3

a) (M&C) v -C

↔ -C v (M&C) – By commutation.

↔ -C v (C&M) – By commutation.

↔ -C v M – By Absorption.

b) ~~C v (C&M)~~

~~↔ C v M – By Absorption.~~ &

b) C v (C&M)

↔ (C&M) v (C&-M) v (C&M) – by expansion

↔ (C&M) v (C&-M) – Redun

↔ C & (M v -M) – Dist

↔ C – Tautology dropped

c) M v (-M & -C)

↔ M v -C – By Absorption.

d) M v -C v (C&M)

↔ M v -C v M – By Absorption

↔ M v (-C v M) – By Association.

↔ M v (M v -C) – By commutation.

↔ (M v M v -C) – By Association.

↔ M v -C – By Redundency.

e) -(M&C) v (-M v -C)

↔ (-M v -C) v (-M v -C) – By Distribution.

↔ -M v -C – By Redundency.

f) (M&C) v (M&-C)

↔ M – By expansion.

g) [(M&C) v (-M&-C)] & (M v C)

↔ [{(M&C) v -M} & {(M&C) v -C}] & (M v C) – by distribution

↔ [{-M v (M&C)} & {-C v (C&M)}] & (M v C) – by commutation.

↔ [(-M v C) & (-C v M)] & (M v C) – by Absorption.

↔ (-M v C) & [(-C v M) & (M v C)] – By Association.

↔ (-M v C) & [M v (C & -C)] – By Distribution.

↔ (-M v C) & M – By contradictory disjunct dropped.

↔ M & (-M v C) – By commutation.

↔ (M & -M) v (M & C) – By distribution.

↔ M & C – By contradictory disjunct dropped.

f)

$\sim(M \& C) \vee \sim(\sim M \& \sim C)$

$\leftrightarrow \sim(M \& C) \vee \sim\sim(M \vee C)$ — By De.M.

$\leftrightarrow \sim(M \& C) \vee (M \vee C)$ — By D.D.

$\leftrightarrow (\sim M \vee \sim C) \vee (M \vee C)$ — By ~~Distri~~ De.M.

$\leftrightarrow \sim M \vee (\sim C \vee M \vee C)$ — By Assoc.

~~$\leftrightarrow \sim M \vee (C \vee ($~~

$\leftrightarrow M \vee (C \vee \sim C \vee M)$ — By com

$\leftrightarrow M \vee [(C \vee \sim C) \vee M]$ — By Assoc.

$\leftrightarrow M \vee (C \vee \sim C)$ — Tautology of the disjunct dropped.

~~$\leftrightarrow M$ — By~~

$\leftrightarrow C \vee \sim C$ — By Tautology of the disjunct dropped.

2.4

b) $[H \vee (M \& C)] \& \sim C$

~~$\leftrightarrow [(H \vee M) \& (H \vee C)] \& \sim C$ — By Dist.~~

$\leftrightarrow \sim C \& [H \vee (M \& C)]$ — By com.

$\leftrightarrow (\sim C \& H) \vee [\sim C \& (M \& C)]$ — By Dist.

$\leftrightarrow (\sim C \& H) \vee [\sim C \& (C \& M)]$ — By com.

$\leftrightarrow (\sim C \& H) \vee [(\sim C \& C) \& M]$ — By Assoc.

$\leftrightarrow (\sim C \& H) \vee (\sim C \& C)$ — By contradictory conjunct dropped.

$\leftrightarrow \sim C \& H$ — By contradictory disjunct dropped.

c) $[H \vee \{(M \& C) \vee (\sim M \& \sim C)\}] \& C$

$\leftrightarrow C \& [H \vee \{(M \& C) \vee (\sim M \& \sim C)]$ — By com.

$\leftrightarrow (C \& H) \vee [C \& \{(M \& C) \vee (\sim M \& \sim C)\}]$ — By Dist.

$\leftrightarrow (C \& H) \vee [\{C \& (M \& C)\} \vee \{C \& (\sim M \& \sim C)\}]$ — By Dist.

$\leftrightarrow (C \& H) \vee [\{(M \& C) \& C\} \vee \{(\sim M \& \sim C) \& C\}]$ — By com.

$\leftrightarrow (C \& H) \vee [\{M \& (C \& C)\} \vee \{\sim M \& (\sim C \& C)\}]$ — By Assoc.

$\leftrightarrow (C \& H) \vee [(M \& C) \vee (\sim C \& C)]$ — By Redundency and contradictory conjunct dropped.

$\leftrightarrow (C \& H) \vee (M \& C)$ — By contradictory disjunct dropped.

$\leftrightarrow (C \& H) \vee [(C \& M \& C) \vee (C \& \sim M \& \sim C)]$ — By Dist.

$\leftrightarrow (C \& H) \vee [(C \& M) \vee (C \& \sim M \& \sim C)]$ — By Redundency.

$\leftrightarrow (C \& H) \vee (C \& M)$ — By contradictory disjunct dropped.