Q-1 (a)

A	B	C	$(A \wedge B) \Rightarrow C) \Rightarrow (A \Rightarrow C) \vee (B \Rightarrow C))$
T	T	T	T
T	T	F	T
T	F	T	T
T	F	F	T
F	T	T	T
F	T	F	T
F	F	T	T
F	F	F	T

Disjunction Normal Form ⇒

$(A \wedge B \wedge C) \vee (A \wedge B \wedge \neg C) \vee (A \wedge \neg B \wedge C) \vee (A \wedge \neg B \wedge \neg C) \vee (\neg A \wedge B \wedge C) \vee (\neg A \wedge B \wedge \neg C) \vee (\neg A \wedge \neg B \wedge C) \vee (\neg A \wedge \neg B \wedge \neg C)$

Q-7 (a) $(\exists x (B(x) \wedge \forall y (C(y) \Rightarrow (S(x,y) \Leftrightarrow \neg S(y,y)))) \Rightarrow \exists x (B(x) \wedge \neg C(x))$

T $(\exists x (B(x) \wedge \forall y (C(y) \Rightarrow (S(x,y) \Leftrightarrow \neg S(y,y)))))$

F $\exists x (B(x) \wedge \neg C(x))$

T $B(a) \wedge \forall y (C(y) \Rightarrow (S(a,y) \Leftrightarrow \neg (S(y,y))))$ $[x|a]$

T $B(a)$

T $\forall y (C(y) \Rightarrow (S(a,y) \Leftrightarrow \neg (S(y,y))))$ $[x|a]$

T $C(a) \Rightarrow (S(a,a) \Leftrightarrow \neg S(a,a))$ $[x|a]$ $[y|a]$

F $C(a)$

F $B(a) \wedge \neg C(a)$

F $B(a)$ | F $\neg C(a)$

T $S(a,a) \Leftrightarrow \neg S(a,a)$

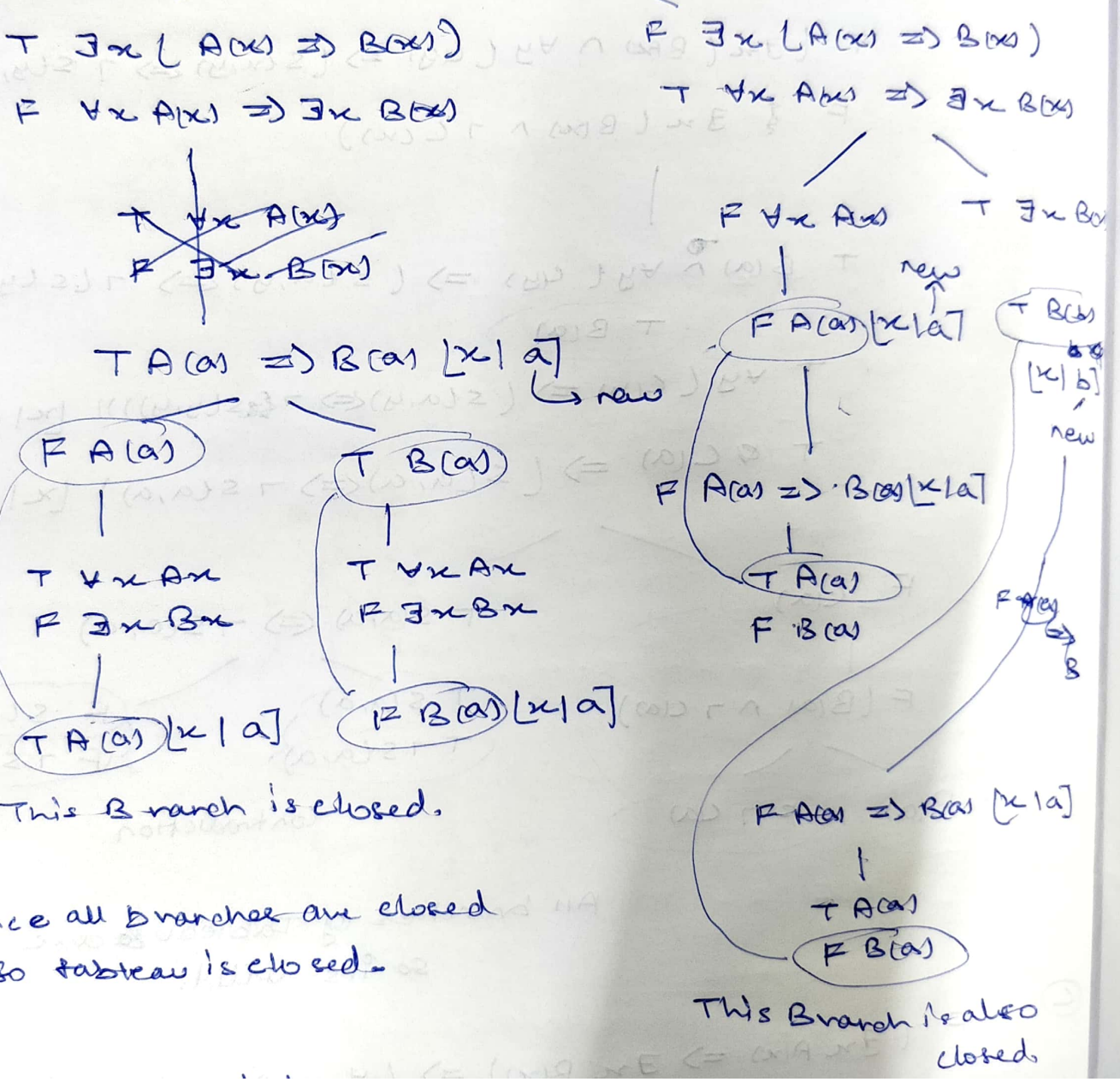
T $S(a,a)$ | T $\neg S(a,a)$

F $S(a,a)$ | F $\neg S(a,a)$

Contradiction

All branches of Tableau are closed
so its valid.

(b) $F\ \exists x (A(x) \Rightarrow B(x)) \Leftrightarrow (\forall x A(x) \Rightarrow \exists x B(x))$



Since all branches are closed so tableau is closed.

(2) $F\ (\exists x A(x) \Rightarrow \exists x B(x)) \Rightarrow (\forall x (A(x) \Rightarrow B(x))$

$T\ \exists x Ax \Rightarrow \exists x Bx$

$F\ \forall x (A(x) \Rightarrow B(x))$

$F\ A(a) \Rightarrow B(a)\ [x|a]$

$T\ A(a)$

$F\ B(a)$

$F\ \exists x A(x)$ | $T\ \exists x B(x)$

$F\ A(a)\ [x|a]$ | $T\ B(b)\ [x|b]$

This branch is open, so Tableau is not closed and 9ts not valid.

Q-3

A : Aldo passed the exam
B : Bruno " " "
C : Carlo " " "

Branch is also closed.

(a) $C \wedge \neg A \wedge \neg B$

(b) $\neg A \wedge B \wedge C$

(c) $(A \wedge \neg B \wedge \neg C) \vee (\neg A \wedge B \wedge \neg C) \vee (\neg A \wedge \neg B \wedge C)$

(d) $(A \wedge B \wedge \neg C) \vee (A \wedge \neg B \wedge C) \vee (\neg A \wedge B \wedge C)$

(e) $(A \wedge B \wedge \neg C) \vee (A \wedge \neg B \wedge C) \vee (\neg A \wedge B \wedge C) \vee (A \wedge B \wedge C)$