

Date _____

Basic Notations

Sentence \rightarrow Combination of words which make any sense.

Statement is Assertion or Denial.

↓
Proposition

↓
Proposition

- a-priori
(which are based on reason)
- Info info is needed
- Can be either True or False

a-posteriori
(which are based on experience or sense data)

(either true or false)
Contingent

Tautology

[Always True]

$(P \vee \neg P)$

Contradiction

[Always False]

$(P \wedge \neg P) \rightarrow$

$P \vee \neg P \rightarrow$ True.

$T \vee F \cdot P = T \rightarrow$

P	Q	$P \vee Q$	$\neg P$
T	F	T	F
T	T	T	F
F	F	F	T
F	T	T	T

Date 1/1/1

ArgumentSet of propositionPremises
(Justification)Conclusion
(Establish)

Argument is a set of proposition divided into Premises and Conclusion in which premises provide justification to claim Conclusion.

Good Reasoningtruth preservation principle

provides tools to have Conclusion through Premises

Deductive LogicInductive LogicFallacies/Mistakes

provides probable some grounds.

Gives absolute conclusive grounds that if premise is true conclusion is also true.

Valid / InvalidStrong / Weak

10/5/18

Date

$$\begin{array}{c} P \supset \neg P \\ \hline T \supset L \end{array}$$

$\neg P = F$

Saathi

~~Truth~~ | Falsity:

Semantics \rightarrow means correspondence

Syntax \rightarrow means coding

F

Statements based on correspondence and
On. \rightarrow I Structure.

Correspondence \rightarrow statement to be reality \rightarrow T
~~not reality \rightarrow F~~

The work of a-priori is structural (syntax)
[Deductive]

The work of a-posteriori is semantics
[Inductive]

P is just factual Priori (false)

$P \vee \neg P$ — a priori (True)

$P \supset P$ — a priori (False)

$P, \neg P$ — (True) or False).

a. posteriori — $\{P \rightarrow \text{either True/False}\} \rightarrow$ Contingent.

a. priori — $\{P \supset \neg P \rightarrow \text{always false} \rightarrow \text{Contradiction}$
 $P \vee \neg P \rightarrow \text{always True} \rightarrow \text{Tautology}\}$

* Truth or Falsity are attributes of statements
or proposition whereas validity are
attribute of argument [Deductive Argument]

Validity | Invalidity

Validity → An argument is valid if it is impossible for the conclusion to be false if its premises are true.

* In a valid argument there exist no substitution instances which can make premises true and conclusions false.

* A valid argument exhibits the following structure.

$$\boxed{\{P_1, P_2, P_3, \dots, P_n\} \rightarrow C}$$

Premises

Conclusion

Premises

Conclusion

Valid / Invalid

T
F
F

T
F
F

V/I
V/I
V/I

- If conclusion of an argument is tautology, then the argument is deemed to be valid.

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

- If the premises are inconsistent [They cannot be true together] then the argument is deemed to be valid.

* Tautology \rightarrow a priori proposition which is always true.

$$Q \vee \neg Q$$

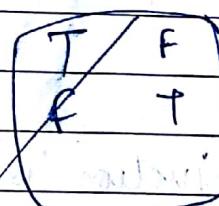
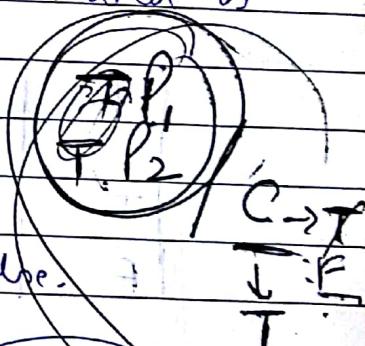


Always true

$$\neg Q \wedge Q$$

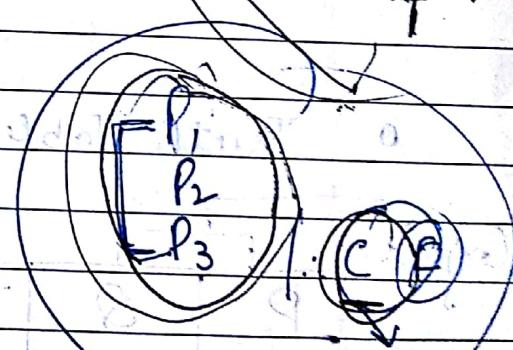


Always false



$$P_1 \wedge P_2 \wedge P_3$$

$$P_1 \wedge P_2 \wedge P_3$$



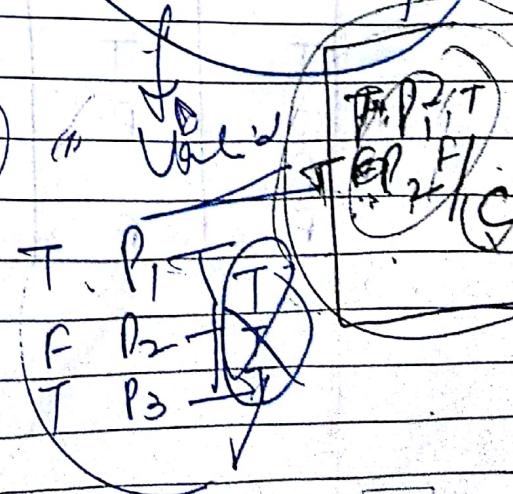
$$P \Rightarrow Q$$

$$F \wedge (R \vee S)$$

$$T \wedge F \wedge R \vee S$$

$$(R \vee S) \vee (a \vee b \vee c)$$

$$a \vee b \vee c$$



21/05/18

Saath

Date / /

RUTH TABLES !-

Decision procedure.

m	T	Truth functional
.	T	connectives
v	T	
p	T	
≡	T	

Simple \rightarrow Cannot be further broken

①

Truth Table of \neg (negation)

P	$\neg P$
T	F
F	T
T	F

②

Truth Table of \wedge

Conjuncts

P	Q	P, Q
T	T	T
T	F	F
F	T	F
P	F	F

Conjunction is true
when all its conjuncts
are true.Both conjuncts should
be true in order
to make this

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• Truth Table of $P \vee Q$.

↓ Disjuncts	P	Q	$P \vee Q$
	T	T	T
	T	F	T
	F	T	T
	F	F	F

A disjunction is false when all its disjuncts are false.

• Truth Table of $P \supset Q$

\uparrow antecedent \downarrow consequent

→ An implication is

P	Q	$P \supset Q$
T	T	T
T	F	F
F	T	T
F	F	T

true when its consequent is true.

→ An implication is true when its antecedent is false.

→ An implication is false when its antecedent is true and consequent is false.

• Truth Table of $P \equiv Q$.

P	Q	$P \equiv Q$
T	T	T
T	F	F
F	T	F
F	F	T

True when both of its propositions are same.

• Well Formed Formula \rightarrow

The proper syntax by virtue of which truth-functional propositions and connectives are formed.

Strengths \rightarrow

 \vee \wedge \neg \Rightarrow \equiv $P \cdot Q \vee R \Rightarrow S$ { $(P \cdot Q) \vee R \Rightarrow S$ }

Statement Form \rightarrow

Statement form is a reorganised form for a well known formula for two or more statements or propositions.

 $P \vee \neg P$ \rightarrow Tautology

always true

 $P \cdot \neg P$ \rightarrow Contradiction

always false

Example →

- $[P \Rightarrow (Q \Rightarrow P)]$ → Paradoxes of Material Implications
- $[\neg P \Rightarrow (P \Rightarrow Q)]$

$$\Rightarrow [P \Rightarrow (Q \Rightarrow P)]$$

Q	P	$Q \Rightarrow P$	$P \Rightarrow (Q \Rightarrow P)$
T	T	T	T
T	F	F	T
F	T	T	T
P	F	T	T

P	$\neg P$	$\neg (\neg P \Rightarrow (Q \Rightarrow P))$
T	F	T T T
F	T	T F F
T	T	F T T
F	F	F T F

$$\Rightarrow [\neg P \Rightarrow (\neg (\neg P \Rightarrow (Q \Rightarrow P)))]$$

$\neg P$	$\neg (\neg P \Rightarrow (Q \Rightarrow P))$
F	T
F	T
T	T
T	T

~~All Inductive Arguments are Invalid.~~

Sound Argument

Sound Argument is a valid argument which has a true premises and true Conclusion.

Sound Argument

Argument must be

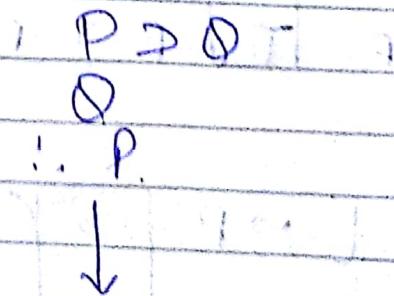
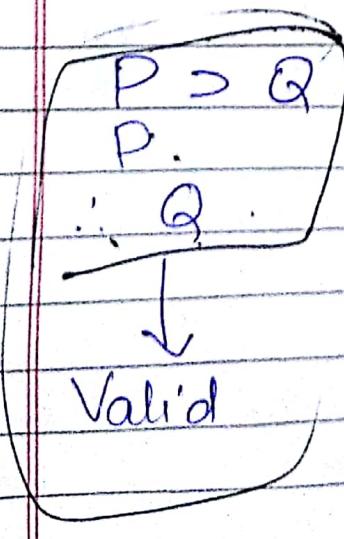
→ Valid

→ Premises - True.

→ Conclusion - True.

Argument Form →

Conclusion is based on premises



A substitution instance of a valid argument retaining its structure will always be valid. Adding an extra premise (one or more) to a valid argument cannot change the nature of that argument.

Symbolization :-

Symbolization is a technique by virtue of which we change the simple language into machine language.

~ or \neg (tilde). [Negation]

[Ans].

~~Answers upto KOR~~

- ① Objectives (T or F) with -ve marking [8-10] marks.
- ② Theory | True Table [6-8] Question
- ③ Symbolisation ✓ [10] marks.
- ④ Proofs → [10-16] marks
- i) ROI [9-rules]
[6-7]
- ii) ROI + ROR [19 rules]
[9-10]

Example :-

⇒ P. P is a tautology = False.

[$P \cdot P \equiv P \rightarrow$ Tautology]

- ⇒ a priori proposition are either true or false.
a posteriori proposition are either true or false = True
- ⇒ The negation of an exclusive disjunction
is equivalent to the equivalence
of two statement-
 $\neg(P \vee Q) \equiv (P \equiv Q)$.

$P \rightarrow Q$ $\neg P$ $\therefore Q$ \Rightarrow $\neg(P \rightarrow Q)$

$$\neg(P \vee Q) \equiv (\neg P \wedge \neg Q)$$

 P Q $P \vee Q$ $\neg P \vee Q$ $P \equiv Q$

$$(P \vee Q) \equiv P \equiv Q$$

 T F T F F F T F F P T F T F T F T F F T T F F F F T F F T F P T F F F F F T F F T T F F F F T F F T F P T F F F F F T F F T T F F F

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⇒ If Amherst does not win its first game, then if both Colgate and Dartmouth do not win their first game

P: Amherst win its first game

Q: Colgate win its fi game

R: Dartmouth win its fi.

⇒ P Q R

$$[\neg P \Rightarrow (\neg Q \cdot \neg R)]$$

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Q

If either Saudi Arabia raises the price of oil or Saudi Arabia does not raise the price of oil then America will be in grave difficulties.

 $\neg(P \vee \neg P)$

\therefore America will be in greater difficulties.

Sol

P: Saudi Arabia raises the price of oil

Q: America will be in grave difficulties.

(Aug 2020) ∞ 100

$$1. (P \vee \neg P) \supset Q. \quad \therefore Q.$$

$$2. \neg(P \vee \neg P) \vee Q.$$

$$3. \neg P \cdot \neg \neg P \vee Q.$$

$$4. \neg P \cdot P \vee Q,$$

5.

$$7. (P \vee \neg P) \supset Q \quad \therefore Q$$

$$2. \neg Q \supset \neg(P \vee \neg P) - 1, \text{ Trans}$$

$$3. \neg \neg Q \supset Q \quad [2, 1 \text{ HS}]$$

$$1. (P \vee \neg P) \supset Q \quad \therefore Q$$

$$2. \neg Q \supset \neg(P \vee \neg P) - 1, \text{ Trans.}$$

3.

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1. $(P \vee \neg P) \Rightarrow Q$ $\therefore Q$.
2. $\neg(P \vee \neg P) \vee Q$ [1 MI]
3. $\neg P, \neg \neg P \vee Q$. [2 QM]
- ~~4. $\neg P, P \vee Q$~~
5. $\neg P \vee P \Rightarrow Q$ (AVD) $\therefore Q$
6. $(Q \vee \neg P) \cdot (\neg Q \vee P)$
7. $\neg P \supset \neg Q$
8. SVA
9. $\neg S \supset A$
10. $\neg A \supset A$
11. $A \vee A$
12. A

MINOR 1 Practice :-

- P : Alice is elected class president
 Q : Betty is elected vice president
 R : Carol is elected treasurer.

$$P \supset (Q \vee R)$$

$$\begin{array}{l} Q \\ \therefore P \supset \neg R \end{array}$$