A proposition is a declarative sentence that is Either doue or folse, but not both.

Ex: 1 washington D.c is the Capital of the United States of America.

Toronto is the capital of India

6x-3 |+|=2

Bx-9 2+2 = 3

consider the following sentences

1) Read this carefully.] not declarative statements

(i) 2l+1=2] they one neither true nor false. (iv) 2l+y=z]

we use letters to denote propositions. usually we se 1, 2, 9, 8, ---

note: If me have a proposition & which is some me represent it by giving p the value T I'my of pir false me give it south rative f. Propositional calculus >:

The area of logic that deals with propositions is called the propositional calculus.

fact -> propositional calculus was developed sy stematically by Greek philosopher Aristothe more than 2300 yes ago.

Compound impositions

modhematical statements that are constructed by combining one or mose propositions are called combound propositions.

Compound propositions.

Definition : Let p be a proposition.

The stadement "It is not the cost that p" is onether proposition, called the regation of p. The regation of p is denoted by $\neg p$

-p is reard " not b"

Find the negotion of the propulation

"Today is Friday"

"It is not the case that today is Friday"

Today is not friday.



Touth torble >:

- 1	þ	¬b
	T	
	F	T

Mote: - it known of regation operator.

Definition (Conjunction)

Let p and & be propositions. The proposition

" p and e", denoted pre, is the proposition

that is true when both p and & are true

and It is false otherwise.

The proposition prq is called Conjunction of p and e.

Tryth table



Definition »: (OK) unction)

let pard & be propositions. The proposition "por 2", denoted pre, it the proposition that it false when pand & are both false and true otherwise. The proposition pre it called disjunction of pond &.

Tru	th	Joble	þ	2	pra
			1	·	T
			P	T 1	T
			F	F	T

Definition 7: (Exclusive or)

Let p and 2 be propositions. The exclusive or of p

let b and 2 be propositions. The exclusive of p cend 2, denoted by b £9, it the proposition that is true when exactly one of b and 2 is true cend false otherwise.

Touth touble

þ	2	þ	P 2
T	T		F
T	F		T
F	T		T
F	F		F



Définition (Implication)

Let b and 2 be propositions. The emplication

b -> 2 is the proposition that is false when

b is bue and 2 is false, and sue alremose

The lills

Truth double

note: in p-2 pir Called Hyprothesis, eir Called Conclusion.

Mote: 9 p-9 e 4 a proposition

Thou

O € → p H Called Commonse of p → 2

(1) -2 > -p is called Combapositive of p -> 2

(ii) -p -> -9 is called onverse of p -> &

Br: what are the Combapositive, the Converse, and	
than handy (OUTOV)	· ດ
The home team wing whenever It is raining!	0
solution b: it is raining e: The home steam wing.	
$O \rightarrow 9$	
D \$ → 2 If it is raining, then the home deam wing.	
(1) Contrapositive	
	vin
of the home team does not use, then it is not orain	
Converse	
$e \rightarrow e$	
of The home seam wins, then It is raining	
mrense 7/2 -> 72	
of 15 is not raining, then the horse team do	ال

VII

Definition (Bi Conditional)

let p and & be propositions. The biconditional $b \leftrightarrow a$ is the proposition that is such when b and a have the same such values, and folse otherwise.

Propositional Equivalence >s

Definition (Tautology, Contradiction, contingency)

- DA compound proposition that is always true, no matter the touth value of the propositions that occur in it, is called a toutology
- (i) A compound proposition that is always false is called a contradiction.
 - a Contradiction is called Contingency.

By p Tp (pv-p) (pn-p) FIT

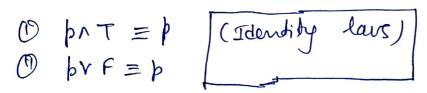
T F T F

Thurshe The proposition pv-p is fautology
and pn-p is a combadiction

Legical Equivalence >:

The propositions p and e are called logically Equivalent of $p \iff e$ is a standagogy. The notation $p \equiv e$ denotes that p and e are logically Equivalent.

Rules for logical Equivalence ...



$$(v)$$
 $|p \rangle | = |p|$ ($1 \text{dem}[po] \text{tent laws})$

$$(vii)$$
 $\neg (\neg p) \equiv p$ (pouble regardion law)

$$(\overline{VII})$$
 $| pvq = qv | p$ (commutative law)

(F)
$$(pve)v91 = pv(ev91)$$
 (Associative law)
(P) $(pve)v91 = pv(ev91)$

(x)
$$pv(2nn) = (pve)n(pve)$$
 (ashibahne law)

$$(x) pr(2v9) = (pr2)v(pr3)$$

$$(71)$$
 $\neg (pnq) = (\neg p) \vee (\neg q)$ Gemongen's law)



(xv)
$$pv(pne) \equiv p$$
 (Absorption law)

(xvi) $pn(pve) \equiv p$ (Negation law)

(xvii) $pv \rightarrow p \equiv T$ (Negation law)

(xviii) $pn \rightarrow p \equiv F$

$$(i) (b \rightarrow 2) \wedge (b \rightarrow 9)$$

$$\equiv b \rightarrow (2 \wedge 9)$$

E. ≠. C