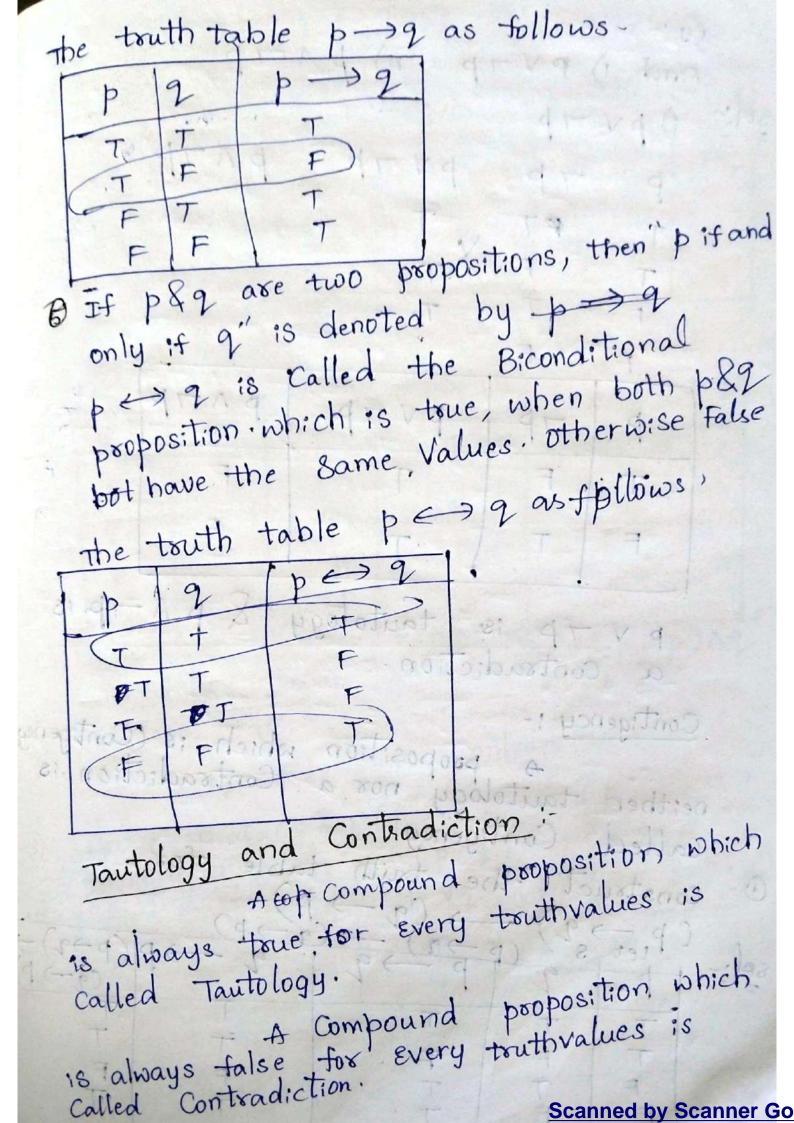
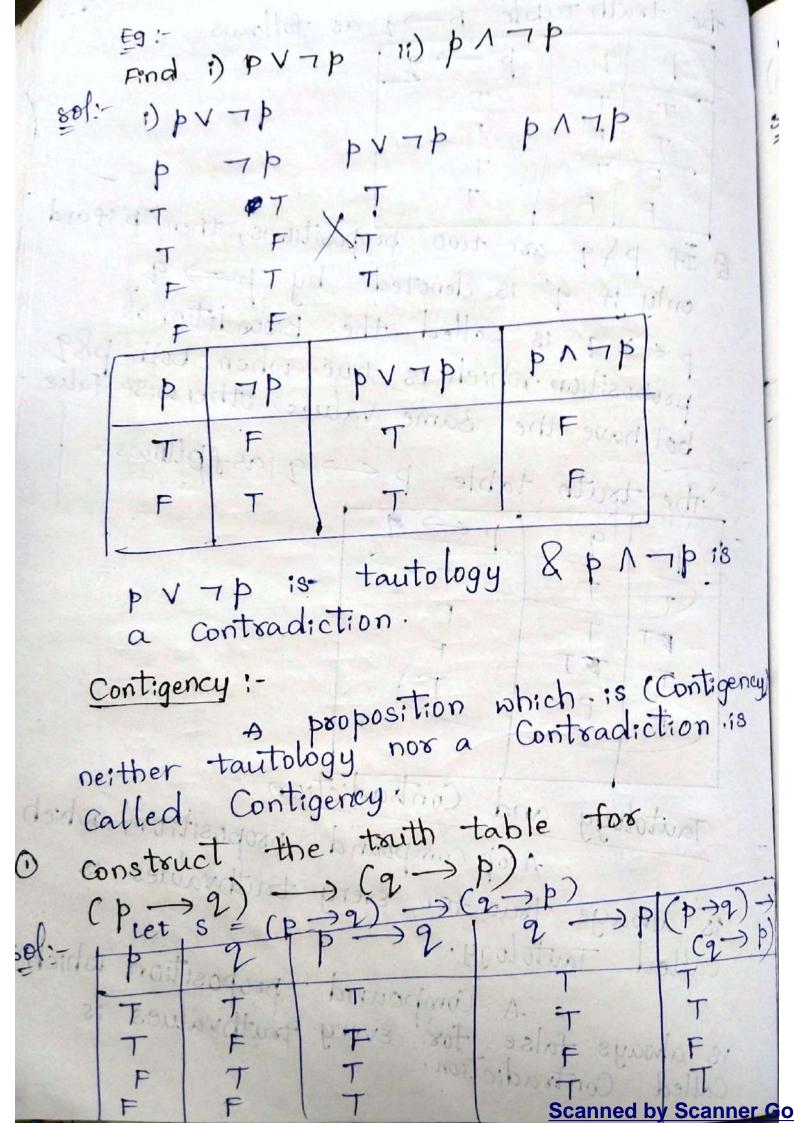
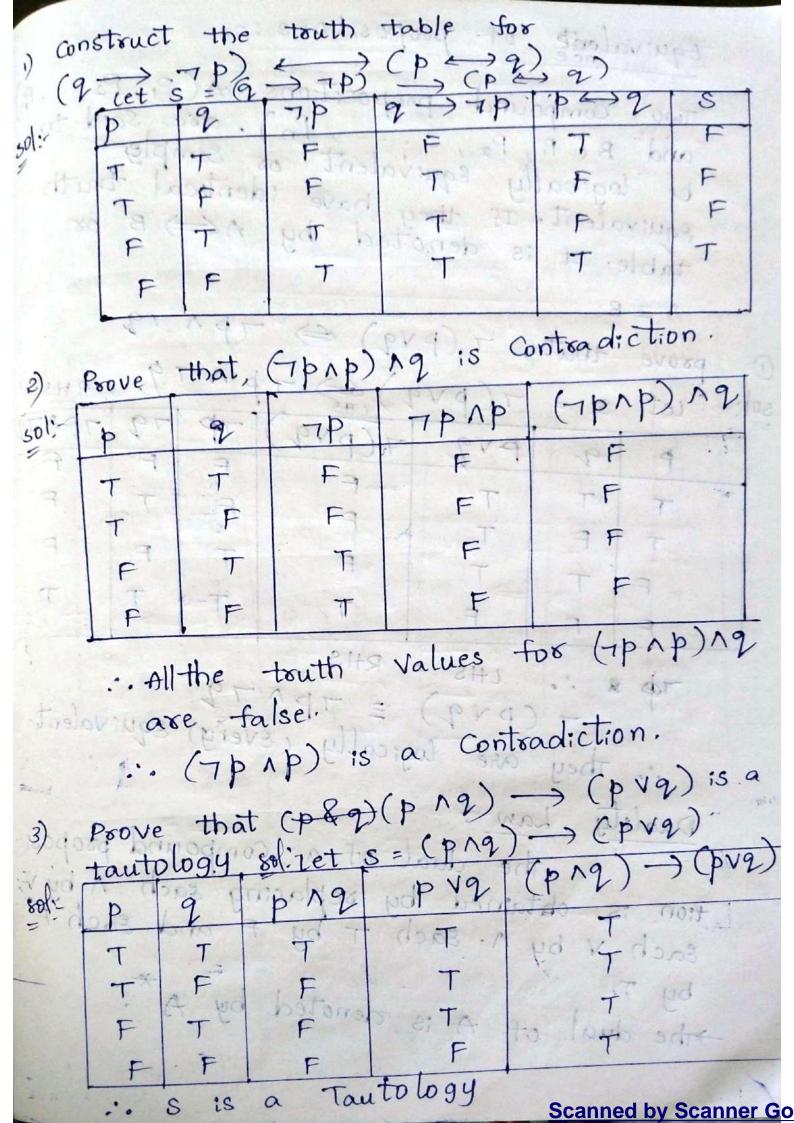
Unit-1 :- Logic Logic: Logic is a discipline that deals with the methods of reasoning. Propositions: A declarative Sentence which is True / False but not both. is called Propositions. (statements). The statements p, q, r, s, -used to denote the propositions.) New Delh: is in London (F) 2) 2+2=4 (T) Tf the proposition is true then its truth value is denoted by T (or) 1. If the proposition is false, its touth Value 18 D. (or) F. 1) If p&q one two propositions then the proposition "p and q" is denoted by progress called the Conjunction and is defined as, if it is true, when p &-9 are Toue Otherwise False. The touth table for prog as follows. P 2 png Scanned by Scanner Go

2) If p and q are two propositions, then
the proposition proq denoted by proposition and is
is called the disjunction and is defined as If it is false then both p&2 are false otherwise True. the touthtable for pv9 are as follows p 2 p v 2 (3) Let p be any proposition then its negation is denoted by Tp (ox) ~ p. The touth table for negation pas follows Ph PTP

2 Ph PTP (4) If p and q are two propositions then "if p then q" is denoted by p > 2 is called the Conditional proposition, which is talse when p is tout and 9 is false otherwise True. Scanned by Scanner Go



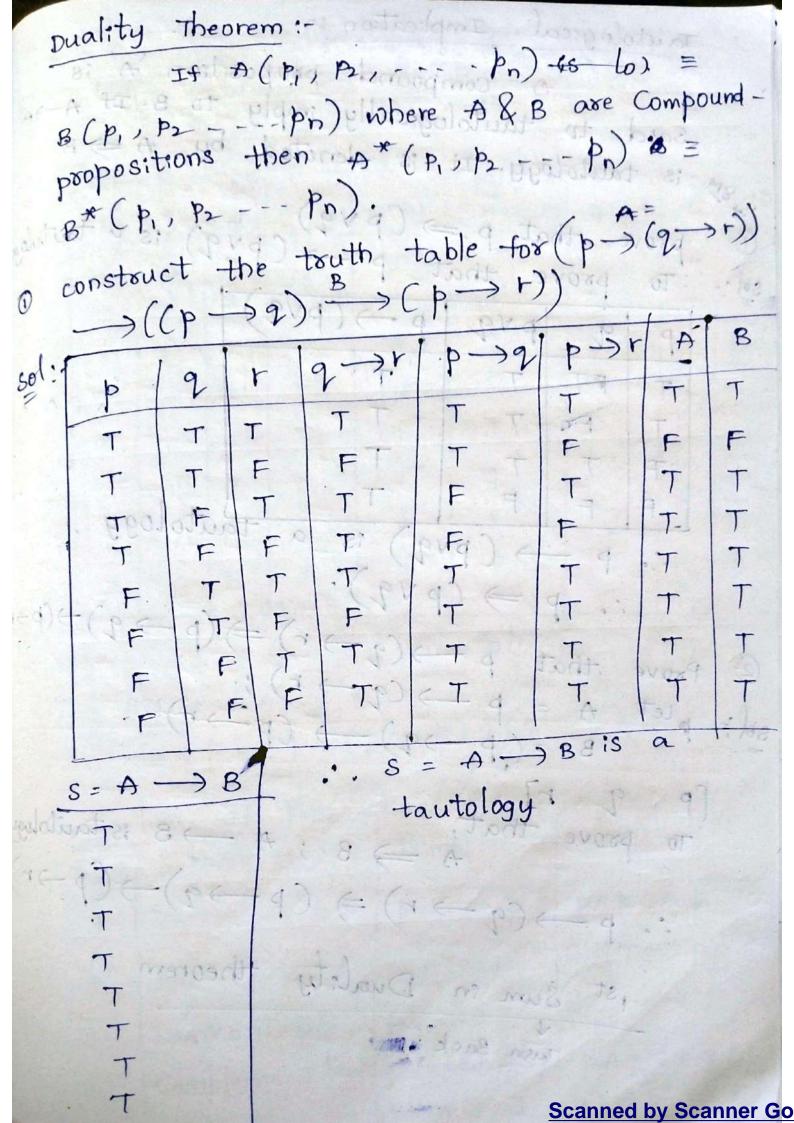




Equivalence of propositions: Two compound propositions A(P1, P2, are said to and B(P1, P2, Pn). are said to be logically equivalent or simply equivalent. If they have identical truth equivalent. If they have by A(=) B or table. It is denoted by A(=) B or O prove that, 7 (pvg) => 7p172. sol: let s = 7(pv9) (+) 7.p 1.79 7 (PV2) = 7PA72 they are logically (Every) Equivalent. Duality Law 1 1) (19) Jode the dual of a Compound proposition is obtained by replacing each h by v, Each V by A. Each T by F and Each F The dual of A is denoted by A.

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Tautological Implication
A compound proposition A is (
Said to tautologically imply to 8- If A so
said to tautology. It is denoted by A > B
prove that, p => (pvq) (pvq) is a tautology
sol: To prove that
P 9 PV2 P (PV2)
TPTTT
TFTT
FFFTT
(pvg) is a tautology
P P CPV)
$\therefore p \Rightarrow Cp \vee 2).$
() =) (b -) 2) >(p)
Prove that $P \rightarrow (Q \rightarrow r)$; Prove that $P \rightarrow (Q \rightarrow r)$; Prove $P \rightarrow P $
de plet A = P - Chipp
of: plet $A = P$ $B = (P \rightarrow Q) \rightarrow (P \rightarrow F)$
[P 2 r] root to at the total and the start of the start o
To prove that, A => B.; A -> B is tautology []
$(p \rightarrow r)$
$(p \rightarrow (2 \rightarrow r) \rightarrow (p \rightarrow 2) \rightarrow (p \rightarrow r)$
1 + thornon
st sum in Duality theorem
Tuen Back.
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Γ,	Algebra of	propositions -	
		Primary Form	Dual Form
7	Idempotent Law	pvp⇔p	p ~ p \ > p
2)	Identity law	pvF⇔p	PATSP
3)	Dominant law	PVT⇔T	PAFGF
4)	Complement	pv¬p⇔ T	p n 7 p to F
5)	Commutative law	pv2 ⇔ 2vp	pn2 ⇒ 2np
6)	Associative law	(pvq) vr => pv(qvr)	(p 12) 1r p 1 (2 1r)
	Distributive Law	pv(q, nr) ↔ (pvq) n(pvr)	p ∧ (2 vr) ⇔ (p ∧2) v (p ∧r)
	Absorption	pv(p∧2)⇔p	p ∧ (p v2) ⇔ p
	Demargon's law	16v2) € > 7p ∧ 72	7(p 12)(=) 7 p v 79

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Equivalences involving Conditionals:
  1) p -> 2 ( >> 7p v 2
  2) p -> 9 ( ) 79 > 7p
  3) (p->2) n (p->r) (2 nr)
  4) (p->9) V (p->r) (qvr)
     (p)r) ~ (2)+) (pvq) ->r
  6) cp ->r) v (q ->r) (pnq) ->r
  Equivalences involving Biconditionals:
  ) p \leftrightarrow 2 \Leftrightarrow (p \land 2) \lor (7p \land 72)
  2) p (p->2) \ (p->2) \ (q->p)
   3) p ( ) 2 ( ) 7p -) 79
O Using touth table, prove that (p \rightarrow (2 \rightarrow s)) \land
(\neg r \lor p) \land 2 \Longrightarrow r \longrightarrow s
soll. To prove that, {[p -> (2 -> s)] ^[7k v p] ^2}
               -> {r -> s} is a tautology.
   Let a = [p \rightarrow (q \rightarrow s)];
                                  (-p)←q]:
           b = [(TINP) 19];
                                  toutology.
          A = a nb; prad (an prad)
           B = r \rightarrow S. ((1/1) \times q) = A tol
               (1- 9) 1 (pv 9) = 8
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						2->5	761	VP	a	b	A	B	BER
	P	2	S	r	71	7		assertation for home					
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·. [p -> (q -> s)] n[7pvp] nq => +-> s is a tautology.

$$7(pv(q \wedge r)) \leftrightarrow ((pvq) \wedge (p \rightarrow r))$$

$$solitet A = (pv(q \wedge r))$$

$$B = [(pvq) \wedge (p \rightarrow r)]$$

$$C = 7[pv(q \wedge r) \leftrightarrow ((pvq) \wedge (p \rightarrow r))$$

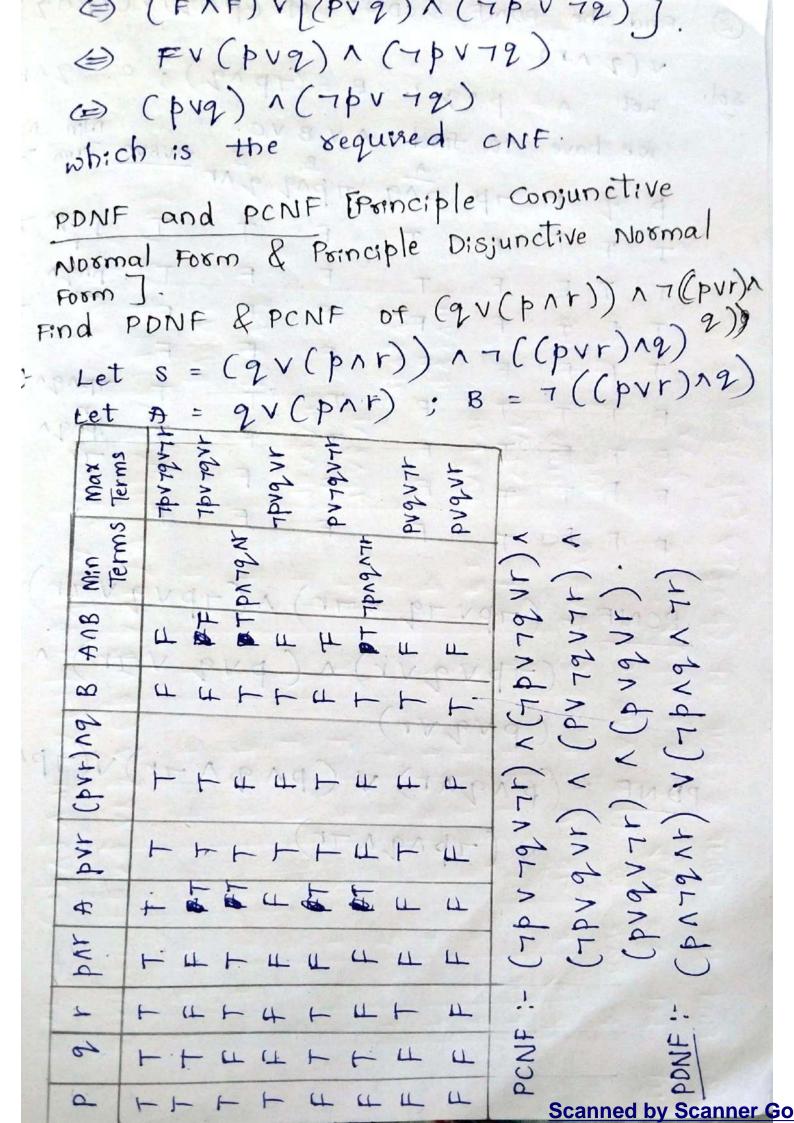
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T	F	T	F	T	F	T	Ť	T	F			
T	F	F	F	T	F	T	F	F	Т			
F	T	T	T	7	F	* Tev	T	T	F			
F	T	F	F	F	AT.	To	Т	T	Т			
F	F	T	F	F	7	F	T	T	F			
F	F	F	F	F	T	F	T	Т	F			
$\neg \neg (p \lor (q \land r)) \longleftrightarrow (p \lor q) \land (p \to r))$												
^qr)v	101	9	わるいの	-	(p) <	> 9/00	tan asini		Cunza I			

prove that (npv2) $\Lambda(p\Lambda(p\Lambda2)) \Leftrightarrow p\Lambda2. without$ using touth table. (7pv2) 1 (p1(p12)) (p12. Consider, LHS (S) (FPVQ) N(PNQ)) (7pv9) N((pnp) N2) [:: Associative $\Rightarrow [\neg p \vee 9] \wedge [p \wedge 9] [...p \wedge p = p]$ ([7p \(p\2)] \[2 \(p\2)]. [: Distributive] €) [(7PNP) NQ)] V [(QNQ) NP] (... Associative, Commutative) (F 19) V (9 1 P) ⇒ FV(p∧2) (=) p∧2. = R.H.S / ... Hence proved. prove that $\neg(p \leftrightarrow 2) \iff (p \land \neg 2) \lor (\neg p \land 2)$ 2) without using truth table. 7(p 0 2) (p 1 7 2) v (7 p 1 2) sol:

7 (p (>2) (>) 7 [(p ->2) ~ (2 -> p)] €> 7 [(p→2) 1 (72 Vp)] 6)7 (Gpv2) 1 (72 Vp)] (7pv9) V7(72vp) (₽172) V(2174) (=) (pn79) v (7pn9) [: p->2 => 7pv2] (p) 1(2 Normal Forms: when the number of propositions P1, P2, Pn increases, better method be used to reduce into standard forms is called Normal forms. Normal Forms. there are 2 types of normal torms. 1) Disjunctive normal Form (DNF) 2) Conjunctive normal Form (CNF) Elementary product: their negations are Called Elementary product 1-89:-P, 7P, P. N2, 7PN2 - - - -

Elementary Sum: negations are called Elementary Sum. Eg:- P, 7p, pvg, px72 ----DNF (Disjunctive Normal Form): sum of Elementary product. Product of Elementary Sum. Find the DNF of $2 \rightarrow (2 \rightarrow p)$. sol: Given; 2 -> (2 -> p) (72 vp) (= 12 V (72 V P) (79 V 79) VP [.. Commutative € 72 V P which is the required DNF [:: p -> 2 (>> 7 pv 2] Find the CNF of 7(pvg) (png) 7(pv2) (p+10 12) (pv2) 1(pv2) (2) sol: V [77(pv2) N 7(pn2)] [: p ↔ 2 (> (p ∧ 2) v (7 p ∧ 7 9)] € [(¬PNP) ~ (¬2 ~2)] v [(pv2) ~ (¬PV



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