





## UNIT I-LOGICS AND PROOFS

## LOGICAL EQUIVALENCE

$p \Leftrightarrow p$ , $p \lor p \Leftrightarrow p$	Idompotent laws
(PAQ) AR (PVQ) VR	Associative laws
anp, pva ⇔ avp	Commutative Laws
7PV 7Q 7PA 7Q	Demorgan's Laws
⇔(PAQ) V (PAR) ⇔ (PVQ) A (PVR)	Distributive laws
F, PVTP \$T	Complement laws
, PAF 侍F.	Domibance Laws
PVF ⇔P	Identity Laws
)⇔P )⇔P	Absorption Laws
⇔P	Double negation law
$\Rightarrow$ 7Q $\Rightarrow$ 7P	Transportation Law
⇒ 7PVQ	matesilal implication
$\Leftrightarrow (P \rightarrow a) \land (a \rightarrow P)$ $\Leftrightarrow (P \land a) \lor (T P \land T a)$	matesilal Equivalence
→RJ谷 (PAQ)→R	Expositation ' Low



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J. Show that (PVQ) A T/TPAQ) \$\$ P (PVO) AT (TPAQ) (PVR) ∧ [¬(¬P) V ¬R] Demosigan's law Double negation law (PVA) A [ PV7A] Distabutive law \$ PV (QATQ) complement law \$ PVF Identity law ♦ P (PVA) AT (TPAQ) (> P. A]. without using touth tables, Show that  $P \rightarrow (Q \rightarrow R) \Leftrightarrow P \rightarrow (7QVR) \Leftrightarrow (PAQ) \rightarrow R$ Material Implication law NOW  $P \rightarrow (a \rightarrow R)$ material Implication 1010  $\Leftrightarrow p \rightarrow (7QVR)$ Asportative law \$ TPV (TQVR) pemergan's law (⇒ (PVTA) VR material Implication law <>> T(PAQ) VR (PAQ) + R J. Show that 7(PAQ) → (TPV(TPVQ)) <> TPVQ NOLD  $\neg (PAQ) \rightarrow (\neg PV(\neg PVQ))$ 今7(T(PAG)) V (TPV(TPVQ)) Material Implication bui Involution law (01) pouble negation law \$ (PAQ) V (TPV(TPVQ)) (PAQ) V ((TPVTP) VQ) Ascossiative law Idempotent law ⇒ (PAQ) V (TPVQ) (PV(TPVQ)) ∧ (QV(TPVQ)) Distibutive law <>> (PVTP) VQ) ∧ (QV (QVTP)) ASSOCIATEVE law commutative law complement law (TVQ) ∧ ((QVQ) VTP) Associative Jaw (AVT) A ( QV ? P) commutative law, Idempotentian (> TA (TPV Q) commutative law, Donsi nance law commutative law (TPVQ)AT Identify law TPVQ 47 Scanned with CamScanner



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## LOGICAL EQUIVALENCE

引 Show that (TPA (TBARS) V (BAR) V (PAR)谷R	
Now,	
$ (TPA (TBAR)) \vee (BAR) \vee (PAR)  (TPATB) AR] \vee [ (QVP) AR] Associative kuv,  DRSHibative kuv,  DRSHibative kuv  (TPATB) \vee (QVP)] AR Dreshibative kuv  (TPATB) \vee (QVP)] AR Dreshibative kuv  commutative kuv  commutative kuv  Compliment law  Densigan's law  compliment law$	
ET OL HALL (GO (TRUTR))) V(TPATR)	5
司. Show that ((PVQ)A T(TPA (TQVTR))) V(TPATQ) Bs a tautology. V(TPATR)	
Now,	
(PVQ) AT (TPA (TQVTR)) V (TPATQ) V (TPATR)	
(PVQ)A ¬ (TPAT(QAR)) V (TPA (TQ VTR)) Tempigan's law Distributive bud	
(PVQ) AT(T(PV(QAR))) V(TPAT(QAR)) Demargan's law,	• 6.
(PVG) ∧ (PV(QAR)) V T (PV(QAR)) Double Negation law Democregan's law	0
> (PVQ) A ((PVQ) A (PVR)) V 7 (PV (QAR)) DESTRIBUTIVE	
((PVQ) A (PVQ)) A (PVR)) V7 (PV(QAR)) DEHPLOANTYCE	
(PVG) ∧ (PVR)) V 7 (PV(GAR)) Idempotent laws (PV(GAR)) V 7 (PV(GAR)) DPStoPbutPve laws (PV(GAR)) V 7 (PV(QAR)) DPStoPbutPve laws Complement laws.	
⇐ T ((PVG) ∧ T (TP ∧ (TQV TR))) V (TP ∧ TQ) V(TP ∧ TR ) V (TP ∧ TQ) V(TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TQ) V (TP ∧ TR ) V (TP ∧ TQ) V (TP ∧	
Carling Count School Stars	_

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6] Shaw that (PAQ) → (PVQ) 38 a tautology. NOCO, (PAQ) -> (PVQ) <>> T(PAG) V(PVG) Material Implecation Demalgan's law (TPVTQ) V (PVQ) Commutative law \$ (TPVTQ) V (QVP) Associative law \$ TPV (TAVA) VP Negation law 今(TPVT)VP pominance law ↔ TVP Dompoand law イチ 丁 : (PAR) > (PVR) is a tautology. Show that Hue J.  $Q \rightarrow (P \rightarrow Q)$  is a tautology. J. QV(PATG) V (TPATG) Ss a toutology. 3]. Show that (P>(B→P) (P> Q) 4. (PAR) -> P is tauto S.  $Q \rightarrow (P \rightarrow Q)$  is a fauto 6. QV(PATE) V (TPATE) is a tau. T. (P>Q) A (P) Q (PVR) - Q 8. T(PAA) -> (-PVI-PVAZ) >> TPVA (TPVR) A (TRVR) (7PATR) VQ 7 IPVRI VO

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