Pavel Ghazaryan | Exercise Sheet 5 ID:10756505 CExercise 1: (P → Q) V (Q → R) =T a) (P→Q) v(Q →R) = (~PvQ) v(~QvR) = ~PvQ v~QvR= = ~PVRVT= (~PVR)VT=T b) (A →B) v (B→c)= (~AvQ) v (~Bvc) = ~AvBv~Bvc= = ~AVCVT=T CExercise 2: a)  $((P \rightarrow Q) \land (Q \rightarrow R)) \rightarrow (\sim P \land R)$ (i) ((P→Q) Λ(Q→R)) → (~PNR) = ((~PVQ) Λ (~QVR)) →  $(\sim P \wedge R) \equiv \sim ((\sim P \vee Q) \wedge (\sim Q \vee R) \wedge \sim (\sim P \wedge R)) \equiv$ = ~ ((~PVQ) A (~QVR) A (PV~R)) CNF  $(i) \equiv ((\sim P \vee Q) \wedge (\sim Q \vee R)) \rightarrow (\sim P \wedge R) \equiv$ = ~ ((~PVQ) 1 (~QVR)) V (~P1R) = ((P1Q) V (Q1P))V V (~PAR)=(PAQ)V (QMR) V (~PAR) DNF (i) ((PAQ) >R) 1 (~(PAQ) >R) = ((~PV~Q) VR) A 1 ((PAQ)VR) = (PVVQ)VR)1 (PVR)1 (QVR) = = ((~PV~QVR)) N(PVR) N(QVR) CNF (ii) ((~PV~Q)VR) A ((PAQ)VR) = RV ((~PVQ)APAQ)= = R v (((~PAP) v (QAP))AQ) = Rv ((~PAPAQ) v (QA~QAP) ERV (~PAPAQ) V (QA~QAP) = RV(IAQ) V (IAP) =RVIVI DNF Page

CExercise 3: (Q→P) → (~PA~Q) = = (~QVP) > MANAMAN (~P1~Q) =  $\equiv (\sim (\sim Q \vee P)) \vee (\sim P \wedge \sim Q) \equiv (Q \wedge \sim P) \vee (\sim P \wedge \sim Q) \equiv$ = ~PA(QV~Q) = ~PAT = ~P So this is not a tautalogy. E Exercise 4: (A→B) V (B→C) =T =>  $\Rightarrow$   $((X \setminus S_A) \cup S_B) \cup ((X \setminus S_B) \cup S_C) =$ = (X\SA)U(X\SB)USBUSC = X USBUSC = X =T / Proved/ E Exercise 5: B3 → B (PAQA~R) V (~PAQAR) >> This is proposition for the truth table =~PN((QN~R)V(QNR))= = ~PA(QA(~RVR)) = ~PAQA(~RVR) = = ~PAQAT= ~PAQ(more simplified) Pavel Chazargan

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