HALMAGYI-FILIP NICHOLAS

PROBLEM 8,3 -913

PROBLEM STATEMENT

8. Write all the anti-models of the following formulas using CNF

3. U3= (p V q -> r) -> (q -> r) ^ p

THEORETICAL RESULTS

- **An interpretation i, which evaluates the formula U as false is called an anti-model of U**
- **A clause is a disjunction of a finite number of literals**
- **A formula is in conjuctive normal form(CNF), if it is as a conjuction of clauses**
- **Logical Equivalence -** $A \rightarrow B \equiv \neg A \vee B$
- **Morgan's Law -** $\neg(A \vee B) \equiv \neg A \wedge \neg \beta$, $\neg(A \wedge B) \equiv \neg A \vee \neg B$
- **Distributive Law -** $A \vee (B \wedge C) \equiv (A \vee B) \wedge (A \vee C)$ **(here only this)**

- **U3= (p V q -> r) -> (q -> r) ^ p** [Logical Equivalence]
- **U3= (-(p V q) V r) -> (-q V r) ^ p** [Logical Equivalence]

- **U3= -(-(p V q) V r) V ((-q V r) ^ p)** [De Morgan's law]
- **U3= ((p V q) ^ -r) V ((-q V r) ^ p)** [De Morgan's law]
- **U3= ((p V q) V (-q V r)) ^ ((p V q) V p) ^ (-r V (-q V r)) ^ (-r V p)** [Distributive Law]
- **U3= (p V q) ^ (-r V p) ---> CNF**

- CNF : (p V q) ^ (-r V p)
- Provides the anti models: I: {p,q,r} -> {T,F}
- p V q = F => i1(p)=F , i1(q)=F , i1(r)=F

  i2(p)=F , i2(q)=F , i2(r)=T

  i1,i2(pVq)=F, i1,i2(U3)=F
- -r V p = F => i3(p)=F , i3(q)=F , i3(r)=T

  i4(p)=T , i4(q)=F , i4(r)=T

  i3,i4(-rVp)=F, i3,i4(U3)=F

I2=i3

CONCLUSION

- **The anti-models of U3 are i1,i2,i4**