lecture 9:- Resolution Principle

literal:- A variable or its negation $p \quad q$
$\neg p \quad \neg q$.

clause: A disjunction of literals

$\neg p \vee \neg q$
$p \vee q \vee r$

$\neg p \vee q$

Step 1:- For each premise find out Corresponding clauses.

P1:- $p \wedge q$ C1:- p
C2:- q

P2: $p \to q$ C1: $\neg p \vee q$

Step 2:- Find the negation of Conclusion. and determine clause.

Step 3:- Repeatedly Apply PR.

$p \vee \cancel{q}$
$\cancel{\neg q} \vee r$
$\therefore p \vee r$.

P1 P
P2 $P \to Q$
C $\therefore Q$.

C1: P ✓
C2: $\neg P \vee Q$. ✓
C3: $\neg Q$. ✓
C4: Q ✓ from C1 and C2.
C5: $\square$ from C3 and C4.

Ex11 P65

P1 $T \to (M \vee E)$
P2 $S \to \neg E$
P3 $T \wedge S$
C. $\therefore M$

C1: $\neg T \vee M \vee E$ ✓
C2: $\neg S \vee \neg E$ ✓

$C1$: $\neg T \vee M \vee E$ ✓
$C2$: $\neg S \vee \neg E$ ✓
$C3$: T ✓
$C4$: S ✓
$C5$: $\neg M$ ✓
$C6$: $\neg T \vee M \vee \neg S$ ✓ from C1 and C2.
$C7$: $M \vee \neg S$ ✓ " C3 " C6.
$C8$: M ✓ " C4 " C7.
$C9$: $\square$ " C5 " C8.

Argument is valid.

Ex7: P62:

p1	$p \to q$	C1	$\neg p \vee q$ ✓	
p2	$\neg p \to r$	C2	$p \vee r$ ✓	
p3	$r \to s$	C3	$\neg r \vee s$ ✓	
C	$\therefore \neg q \to s$	C4	$\neg q$ ✓	
		C5	$\neg s$. ✓	
		C6	$q \vee r$ ✓	from C1, C2.
		C7.	$q \vee s$. ✓	from C3, C6.
		C8	s ✓	" C4, C7.
		C9	$\square$	" C5, C8.

$\neg(\neg q \to s)$
$= \neg(q \vee s)$
$= \neg q \wedge \neg s$.

Argument valid.

HW.
P 70 – 72.
Exercise 1 – 30

Quiz # 5

Prove or disproof.

p1 $L \to A$
p2 $E \to \neg I$
p3 $A \to E$
C. $\therefore L \to \neg I$.

RELATIONS

→ SET: A Collection of distinct objects.

$\rightarrow$ SET : A Collection of distinct objects.

(ظاہری شکل) Syntax. $\{\ \}$. 1- جامع

2- مانع

Semantics Repetition Not allowed.

$A \times B$ $A = \{1, 2, 3\}$. $B = \{a, b\}$.

$A \times B = \{(1,a), (1,b), (2,a), (2,b), (3,a), (3,b)\}$.

$B \times A = \{(a,1), (a,2), (a,3), (b,1), (b,2), (b,3)\}$.

Cardinality of a Set $|A| = 3$

" " " " $|B| = 2$

$|B \times A| = |A \times B| = |A| \times |B| = 3 \times 2 = 6$.

$\{1, 2, 3, 4\}$
$= \{2, 3, 4, 1\}$.

Subset $A \subseteq B$.

Power Set (A) = All Subsets of A.

$A = \{1, 2, 3\}$.

$PS(A) = \{\Phi, \{1\}, \{2\}, \{3\}, \{1,2\}, \{1,3\}, \{2,3\}, \{1,2,3\}\}$.

$|PS(A)| = 2^{|A|} = 2^3 = 8$.

$PS(A \times B) = 2^{|A \times B|} = 2^{3 \times 2} = 2^6 = 64$.

$= \{\Phi, \{(1,a)\}, \{(1,b)\} \ldots \}$.