

**Department of Humanities and Social Sciences**  
**IIT Delhi**

**HUL 251 Introduction to Logic**

**Major Examination C**

Venue: LH114

Date: November 23, 2015

Maximum Marks: 40

Time: 13.00 - 15.00 Hrs

Note: All questions are compulsory. Marks for each section are given in brackets. While constructing truth trees for question nos. 1 & 2 in Section I, it is necessary to give proper justifications. Trees without justifications would not be evaluated. Make sure that you write the version of your question paper on the first page of the answer book.

**Section I. Truth Trees (10 x 2 = 20 Marks)**

1. Check whether the following two PL statements are logically equivalent by means of *truth-tree method*

$$(0 \rightarrow 0) \rightarrow 1 \rightarrow (0 \rightarrow 0)$$

(a)  $((A \& B) \supset B) \supset (A \supset C)$

$a A \sim b \quad X$   
 $\sim a A b \quad X$   
 $1 \rightarrow 0$   
 $0 \rightarrow 1$

(b)  $(A \& B) \supset (B \supset C)$   
 $0 \rightarrow 0 \quad 1 = 1$

Basing on the trees you construct, state clearly why you consider or do not consider them to be logically equivalent.

2. Check whether the following argument in RPL= is valid, using *truth-tree method*

(a)  $(\exists x)(\forall y)((\sim F^2xy \supset x = y) \& G^1x)$

$((\sim F^2aa) \rightarrow (a=a))$

(b)  $\therefore (\forall x)(\sim G^1x \supset (\exists y)(y \neq x \& F^2yx))$

$\exists x (\sim (\sim G^1x \rightarrow \exists y (y \neq x \& F^2yx)))$

**Section II. Translate the following into RPL or RPL= using the dictionary given in brackets (10 x 1 = 10 Marks)**

1. Everyone except Bill left.

( $L^1$ : left,  $b$ : Bill,  $P^1$ : being a person)

2. Honest candidates always get defeated by dishonest ones.

( $C^1$ : being a candidate;  $H^1$ : being honest;  $D^2$ : defeats)

$\sim G^1a \& \sim (b = \dots)$

3. Every other mountain is smaller than Everest.  
( $M^1$ : being a mountain;  $S^2$ : being smaller than;  $e$ : Everest)
4. Only Everest is worth climbing.  
( $W^1$ : worth climbing;  $e$ : Everest)
5. Only men work every shift.  
( $S^1$ : being a shift;  $W^2$ : works;  $M^1$ : being a man)
6. Eric Blair is none other than George Orwell.  
( $b$ : Eric Bair;  $o$ : George Orwell)
7. Every man who has a son gave some woman who has a son some toy which is expensive.  
( $M^1$ : being a man;  $W^1$ : being a woman;  $T^1$ : being a toy;  $S^2$ : is the son of;  $E^1$ : being expensive;  $G^3$ : gives)
8. If some boy likes Bill, then he likes Frank as well.  
( $B^1$ : being a boy;  $L^2$ : like)  $f$ : frank  $b$ : bill  $\forall x ((B^1x \wedge L^2xb) \rightarrow \dots)$
9. Everyone doesn't like anyone.  
( $P^1$ : being a person;  $L^2$ : like)
10. All barbers who do not shave themselves don't shave any barbers.  
( $B^1$ : being a barber;  $S^2$ : shaves)

### Section III. Give short answers to the following: (5 x 2 = 10 Marks)

- ① What is a syllogism? What are the three kinds of syllogism? Explain with the help of examples.
2. What is a *reductio ad absurdum* argument? How is it employed in the truth-tree method for checking the validity of arguments?
3. What is the notion of consistency? How would you define validity in terms of consistency?
4. Distinguish between nomological necessity and logical necessity with help of examples.
5. Distinguish between atomic statements and complex statements in RPL.