



## B1 LOGIC

Answer all questions

All questions have equal value

### PART A. BASIC LOGICAL NOTIONS

1. When is a set of propositions logically consistent?
2. Can the members of a consistent set of propositions be false? Explain your answer.
3. If you know that the premises of an argument form an inconsistent set, what, if anything, can you conclude from this about the validity of the argument? Explain your answer.

### PART B. SYMBOLIZATION IN SL

Symbolize into SL, using the following key:

A: Arsenal will win the Champions League

M: Manchester United will win the Champions League

L: Liverpool will win the Premiership.

4. If Liverpool doesn't win the Premiership, then either Arsenal or Manchester United will win the Champions League.
5. Neither Arsenal nor Manchester United will win the Champions League.
6. Liverpool will win the Premiership only if Manchester United wins the Champions League.

### PART C. SYNTAX AND SEMANTICS OF SL

7. Explain what it is to define the language SL and outline a definition of it.
8. Suppose that we symbolize a proposition P into SL and we discover that the SL-sentence with which we have symbolized P is not truth-functionally true. Can we conclude from this that P is not logically true? Justify your answer.
9. Use the truth table method to determine whether the argument

$$\begin{array}{l} A \supset \sim A \\ (B \supset A) \supset B \\ \hline A \equiv \sim B \end{array}$$

is truth-functionally valid. Explain your answer.

### PART D. SD DERIVATIONS

10. Derive in SD the conclusion  $F \& G$  from the premises  $F \equiv G$  and  $F \vee G$ .
11. Derive in SD the conclusion  $\sim Q \supset \sim P$  from the premise  $P \supset Q$ .
12. Derive in SD the conclusion  $((A \supset ((A \vee B) \supset C)) \& A) \supset C$  from no premises.

## PART E. SYMBOLIZATION IN PDI

Symbolize in PDI, using the following key:

U.D.: People

Rx: x is right handed

Cx: x is curious

Lxy: x likes y

13. Every right handed person is curious
14. At least one curious person likes everyone who is right handed.
15. There is exactly one curious person.

## PART F. SYNTAX AND SEMANTICS OF PLI

16. What is an interpretation for a sentence of PLI?
17. Provide an interpretation on which the sentence  $(\forall x)(Px \supset Rxx)$  is true, and one on which it is false.
18. "Showing that a sentence of SL is truth-functionally true is not essentially harder than showing that a sentence of SL is not truth-functionally true, but showing that a sentence of PLI is quantificationally true is essentially harder than showing that a sentence of PLI is not quantificationally true." Discuss.

## PART G. PD DERIVATIONS

19. Derive in PD the conclusion  $(\forall x)(Ax \supset Cx)$  from the premises  $(\forall x)(Ax \supset Bx)$  and  $(\forall x)(Bx \supset Cx)$ .
20. Derive in PD the conclusion  $(\forall x)(\exists y)Rxy$  from the premise  $(\exists y)(\forall x) Rxy$ .
21. Derive in PD the conclusion  $(\forall x)(\exists y)(Py \supset Px)$  from no premises.

END OF PAPER