PHILOSOPHY TRIPOS   Part IA

Tuesday 28 May 2002   9 to 12

Paper 3

LOGIC

Answer **four** *questions only.*

Write the number of the question at the beginning of each answer.
Please answer **all parts** *of each numbered question chosen.*

> **You may not start to read the questions**
> **printed on the subsequent pages of this**
> **question paper until instructed that you**
> **may do so by the Invigilator**

1   For each of the following arguments give a translation into PLC and use **either** the truth table **or** the tableau (tree) method to decide whether it is valid:

(a)   If Romeo is happy then he loves Juliet or Katherine. So either if Romeo is happy then he loves Katherine, or if Romeo is happy then he loves Juliet.

(b)   If Darcy loves Dione then either he doesn't love Tess or he is a cheat. But it isn't true that he loves Tess but not Dione. So it isn't the case that either Darcy is a cheat or he doesn't love Dione.

(c)   It isn't true that if the Tories win the next election then the next government will abolish the Health Service. So if the Tories don't win the next election then the next government will abolish the Health Service.

(d)   If I work hard I will not fail. So either if I work hard I will fail or if I don't work hard I will not fail.

(e)   It is raining only if it is pouring. But it is not pouring. So if it is raining then I am the Pope.

2   Translate the following sentences into the language of predicate calculus with identity, explaining the translation scheme you use.

(a)   The King of France is the only person who likes Tim.
(b)   No logician likes any other logician.
(c)   There is a town to which all roads lead.
(d)   All roads lead to a town.
(e)   There are either exactly three or exactly four logicians.
(f)   No tennis player is admired by any squash player who admires some darts player.
(g)   Every darts player is fatter than some tennis player.
(h)   Some tennis player is fatter then the fattest darts player.
(i)   The tennis player who is fatter than the fattest darts player admires any logician who admires the fattest tennis player.
(j)   Nobody is a tennis player unless he is a squash player.
(k)   Tim is fatter than the King of France.

3   Show that the following arguments are valid by translating them and using predicate tableaux (trees).

(a)   There is a town to which all roads lead. So all roads lead to a town.
(b)   Some penguins are carnivores. All carnivores eat mice. So some penguins eat mice.
(c)   There are at least three donkeys. So there are at least two donkeys.
(d)   No humans are immortal. Hercules has defeated Xena Warrior Princess. No mortal has defeated Xena Warrior Princess. All postmodernists are humans. So Hercules isn't a postmodernist.

[TURN OVER for continuation of question 3]

(e) Somebody is fatter than Hercules and whoever it is is fatter than Tim. Nobody who has defeated Tim is fatter than him. Xena has defeated Tim. So Xena is not fatter than Hercules.

(f) The donkey admired by Tim is not a carnivore. So no carnivore admired by Tim is a donkey.

4   Say which of the following statements is true and which false. For those that are false give counterexamples.

(a) All valid arguments have true conclusions.
(b) All valid arguments have true premises.
(c) All valid arguments have consistent premises.
(d) All invalid arguments have consistent premises.
(e) If an argument has a tautologous conclusion then it is valid.
(f) All arguments with contradictory conclusions are invalid.
(g) You can never make a valid argument invalid by adding to its premises.
(h) If 'p, therefore q' is valid then so is 'not-p, therefore not-q'.
(i) If 'p, therefore q' is valid then so is 'not-q, therefore not p'.
(j) Whenever 'p, therefore q' is valid, then so is 'q, therefore $p \supset q$'.

5   *(a)* For each of the following relations the domain is the set of people. In each case say whether the relation is (I) symmetric, (II) transitive, (III) reflexive. If the answer in any case is no, then explain briefly why.

(i) X is the father of Y;
(ii) X is a descendant of Y;
(iii) X is as tall as Y;
(iv) X looks the same height as Y;
(v) a majority of people prefers X to Y;
(vi) X was born in the same town as Y;
(vii) X was born in the same town as Y or died in the same town as Y.

(b) Explain briefly what is meant by the term 'equivalence class' and the 'size' of an equivalence class. What is the smallest equivalence relation? What is the biggest?

6   Are there necessary truths which cannot be known apriori?

7   What are the paradoxes of material implication? What do they show about the relation between English and the formal language of the propositional calculus?

8   Is there a defensible distinction to be drawn between analytic and synthetic truths?

9   Distinguish between sentences, statements, and propositions. Which are arguments made up of?

10   Does Russell's theory provide a correct method of eliminating definite descriptions from all contexts in which they occur, from some contexts, or from none?

END OF PAPER