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LGIC 010 & PHIL 005
Practice Examination I
Spring Term, 2009

1. (20 points) For each of the following truth-functional schemata, indicate in the space provided whether it is valid, satisfiable but not valid, or unsatisfiable.
 - (a) $((p \oplus q) \equiv (p \equiv q))$ unsatisfiable
 - (b) $((p \oplus q) \equiv (p \vee q))$ satisfiable

2. (20 points) For each of the following pairs of truth-functional schemata, write “YES” in the space provided, if the first schema of the pair implies the second, and write “NO,” if the first schema does not imply the second.
 - (a) $(p \oplus q)$ $(p \supset q)$ NO
 - (b) $\neg(p \supset q)$ $(p \oplus r) \oplus (q \oplus r)$ YES

3. (40 points) Answer each of the following questions.
 - (a) Write down as long a list of truth-functional schemata involving only the sentence letters “ p ” and “ q ” as you can, so that each schema on your list implies the next schema on your list, but is not implied by it? Number the schemata in the order in which you intend them to appear.
 - i. $p \wedge \neg p$
 - ii. $p \wedge q$
 - iii. $p \equiv q$
 - iv. $p \supset q$
 - v. $p \supset p$

 - (b) How long a list of truth-functional schemata involving only the sentence letters “ p ,” “ q ,” and “ r ” can you write down so that each schema on your list implies the next schema on your list, but is not implied by it, and each schema on your list implies “ $p \vee (q \wedge r)$ ”? 6

 - (c) How long a list of truth-functional schemata involving only the sentence letters “ p ,” “ q ,” and “ r ” can you write down so that no two schemata on your list are equivalent? 256

- (d) How long a list of truth-functional schemata involving only the sentence letters “ p ,” “ q ,” and “ r ” can you write down so that no two schemata on your list are equivalent and every schema on your list is implied by “ $((p \oplus q) \oplus r)$ ”? 16

4. (20 points) Answer each of the following questions.

- (a) How many structures with universe of discourse $\{1, 2, 3, 4, 5\}$ interpreting only the monadic predicate letter “ F ” satisfy the following schema? 31

$$(\exists x)Fx$$

- (b) How many structures with universe of discourse $\{1, 2, 3, 4, 5\}$ interpreting only the monadic predicate letters “ F ,” “ G ,” and “ H ” satisfy the following schema? 29,760

$$\neg(\forall x)(Fx \equiv Gx) \wedge \neg(\forall x)(Fx \equiv Hx) \wedge \neg(\forall x)(Hx \equiv Gx)$$