國立中正大學 碩士班甄試 邏輯試題 2009/11/20

In this test,

"¬" means "not",

"∧" means "and",

"∨" means "or",

"→" means "if...then...",

"↔" means "if and only if",

"∀x" means "for all x", and

"∃x" means "for some x".

I. True or False

Please answer each of the following questions by writing **True** or **False.** No explanation is necessary. **(20 points; 4 points each)**

1. [(A∨B)→C]→[(D∧¬C)→(A→E)] is a tautology.
2. ∃x(∀yPy→Rx) is logically equivalent to ∀yPy→∃xRx.
3. Suppose A is contingent. If A and B are inconsistent and A and C are inconsistent, then B and C must be inconsistent.
4. P∧R logically implies Q if and only if P logically implies P→Q and R logically implies R→Q.
5. A is true unless B is false. So A and B cannot be both true.

II. A politician made the following statement during a TV interview:

"If I am not attending a congressional meeting, I am planning for a better future of our country. And if I am not planning for a better future of our country, I am listening to our people for their opinions." What's wrong with his statement? **(20 points)**

III. Let "Lxy" stand for "x loves y",

   "Hxy" stand for "x hates y" and

   "Px" stand for "x is a philosopher".

Please symbolize the following sentence. **(30 points)**

Someone who is not a philosopher loves exactly two different philosophers who hate each other.

IV. Please prove the following **valid** argument. (You may use the system on the next page. But virtually all formal proof systems are acceptable; just make your proof as clear as possible). **(30 points)**

∀x(Rx↔Qx), ∃x(¬(Px↔Qx)↔Rx) /∴ ∀x((∃yRy∧∃yQy)→Px)→∀x¬Rx