LICENCIATURA EN CIENCIAS DE LA COMPUTACIÓN

Lógica

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UNIT 2: FIRST ORDER LOGIC

1) Express symbolically the following statements:

1. Marcus is a man.
2. Marcus was Pompien.
3. All Pompien were Romans.
4. Every gardener likes sun.
5. All purple Mushrooms are poisonous.
6. Everyone is loyal to someone.
7. Everyone loves everyone.

2) Write in first order logic the following statements.

1. Holmes can trap anyone who can trap Moriarty.
2. Holmes can trap anyone whom Moriarty can trap.
3. Holmes can trap anyone who can be trapped by Moriarty.
4. If anyone can trap Moriarty, the Holmes can.
5. If everyone can trap Moriarty, then Holmes can.
6. Anyone who can trap Holmes can trap Moriarty.
7. Everyone can trap someone who cannot trap Moriarty.
8. Anyone who can trap Holmes can trap anyone whom Holmes can trap.

3) Express the following statements symbolically using the predicate Knows(x,y):"x know y":

1. Everyone knows someone.
2. Someone knows everyone.
3. Someone is known by everyone.
4. Everyone knows someone who does not know him.
5. There is someone who know everyone who knows him.

4) Using the symbol $<$ express symbolically the following statements about natural numbers.

1. x is greater then y
2. For every number there is a greater number.
3. For every number there is a lesser number.
4. Every number is greater than some number.

5) Express symbolically the following statements:

1. Every student has an id number.
2. Some prime numbers are even numbers.
3. Everyone likes chocolate.
4. Every rock star is liked by some fan.

6) Translate into first order logic the following statements.

The law says that it is a crime for an American to sell weapons to hostile nations.

The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American.

Prove that Col. West is a criminal.

7) Select any domain and express it in symbolically. For example, the domain of family relationtships.

8) If feasible define the primitive recursive predicate for each proposition, otherwise explain why it is not possible to define the predicate

1. $\neg(p \vee \neg q) \rightarrow \neg p$

2. $p \to (q \to r)$
3. $(p \to q) \to r$
4. $(p \to q) \to (q \to p)$
5. $[p \wedge (p \to q)] \to q$
6. $(p \wedge q) \to p$
7. $q \longleftrightarrow (\neg p \vee \neg q)$
8. $[(p \to q) \wedge (q \to r)] \to (p \to r)$
9. $(p \vee q) \to (p \wedge q)$
10. $(p \to q) \to (q \to p)$
11. $(q \to \neg p) \leftrightarrow (p \leftrightarrow q)$
12. $(p \to q) \to (q \to p)$
13. $(\neg p \leftrightarrow \neg q) \leftrightarrow (p \leftrightarrow q)$
14. $(\neg q \wedge (p \to q) \to \neg p$
15. $((p \to q) \wedge (q \to r)) \to (p \to r)$
16. $\neg(q \to r) \wedge r \wedge (p \to q)$
17. $((p \vee q) \wedge (p \to r) \wedge (q \to r)) \to r$
18. $(p \vee q) \to (p \wedge q)$
19. $[p \to (q \to r)] \to [(p \to q) \to (p \to r)]$