Logic and Set Theory | Nueva Vizcaya State University | Midterm Exam
O. D. Hombrebueno | College of Teacher Education | October 11, 2018

Name: _____

Course and Year: _____

Part 1. Give the truth value of each statement if t is true. Write T or F after the statement.

1. $\sim p \to t$
2. $\sim p \vee t$
3. $p \to (t \vee \sim p)$
4. $p \wedge \sim t$
5. $\sim (p \to t)$

Part 2. Give the truth value of each sentence. Write T or F after the sentence.

1. $p \wedge q$ if q is not true.
2. $p \to (p \vee q)$ if p is true.
3. $(\sim p \vee r) \vee (q \to s)$ if q is false.
4. $p \to (q \vee \sim r)$ if r is false.
5. $p \to q$ if $\sim (p \wedge q)$ is false.

Part 3. Find the truth value of each symbolic statement. Show your solution

1. Let p be true, q be false and r be true.

a. $r \to (p \to q)$ b. $\sim [(p \wedge q) \to (r \leftrightarrow q)]$

2. Let p be true, q be false and r be false.

a. $\sim p \to (q \wedge r)$ b. $\sim [(\sim q \wedge p) \leftrightarrow r] \to q$ c. $(\sim p \leftrightarrow \sim r) \vee [p \to (q \to r)]$

Part 4. Determine whether the statement is a tautology, a contradiction or indeterminate. Use a truth table to show your answer.

a. $\sim q \vee (p \to q)$ b. $p \to [(\sim q \to p) \wedge (q \vee \sim p)]$ c. $(p \wedge q) \wedge (q \to \sim p)$

Part 5. Determine the relation between the two statements. Use a truth table to show your answer.

a. $(p \wedge q) \rightarrow (p \vee q)$

b. $(p \wedge \sim q) \leftrightarrow (p \rightarrow q)$

Part 6. Write the converse, inverse and contrapositive of "If n^2 is even, then n is even."

Part 7. Give the Rules of Replacement and the Rules of Inference.

Part 8. Represent the argument symbolically and determine whether it is a valid argument. Use method 1, method 2, and method 3 for items 1, 2, and 3 respectively.

1. Mark attended his classes or he went to the mall.
   Mark did not went to the mall.
   $\therefore$ He attended his classes.

2. If you will do your best in the contest, then I will not win.
   If I will not win, then I will be sad.
   $\therefore$ If you will do your best in the contest, then I will be sad.

3. Mathematics is fun and challenging.
   Mathematics is fun or easy.
   Mathematics is not easy.
   $\therefore$ Mathematics is challenging.

Part 9. Assume each statement is true and draw a valid conclusion.

1. If Ryan is industrious, then he is responsible.
   Ryan is industrious.
   Ryan is not responsible or trustworthy.

2. Logic and Set Theory is very interesting.
   Logic and Set theory is not easy.

3. The president is not corrupt or the people dont trust the president.
   If the people dont trust the president, then the country is in chaos.

Part 10. Derive a conclusion from the following premises assuming they are true.

1. $p \to q$
   $\sim r \to \sim q$
   $\sim r$
   _____

2. $p \leftrightarrow q$
   $\sim p \vee r$
   $\sim r$
   _____

3. $j \to (k \wedge \sim l)$
   $(k \wedge \sim l) \to m$
   j
   _____

A good proof is one that makes us wiser. *Yu. I. Manin*