PHIL 110: FIRST LOGIC EXAM

ANSWER KEY

A. Validity and Soundness

True or False? For each question, answer “True” or “False”. [2 points each (6 points total)]

1. Every valid argument has true premises. FALSE
2. A sound argument may have a false conclusion. FALSE
3. There are valid arguments which have no premises. TRUE

For each of the following arguments, answer the following three questions:

(A) Is the argument valid or invalid?
(B) Is the argument factually correct or not factually correct?
(C) Is the argument sound or unsound?

[6 points for each of 4, 5, and 6 (18 points total)]

4. All fish are robots. VALID
   Some cows are fish. NOT FACTUALLY CORRECT
   Therefore, some cows are robots. UNSOUND

5. All dogs are mammals. INVALID
   All golden retrievers are mammals. FACTUALLY CORRECT
   Therefore, all golden retrievers are dogs. UNSOUND

6. All dogs have wings. INVALID
   Some creatures with wings have tails. NOT FACTUALLY CORRECT
   Therefore, some dogs have tails. UNSOUND

B. Truth Tables

For each of the following statements, construct a truth-table to determine whether it is a tautology, a contradiction or a contingent statement. Label the statement accordingly. Provide a complete truth-table for each statement. [5 points each (15 points total)]

7. \(( P \rightarrow (Q \rightarrow P))\)
For each of the following arguments, construct a truth table to determine whether it is valid or invalid. Label it accordingly. Provide a complete truth table for each argument. [6 points each for 10 and 11; 7 points for 12 (19 points total)]

10. \((A \rightarrow B) \rightarrow \sim A \rightarrow \sim B\)

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INVALID

11. \((P \leftrightarrow \sim Q) \rightarrow Q \rightarrow \sim P\)

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VALID

ANSWER KEY
12. \(((A \lor B) \rightarrow \sim B) \land \sim A \land C\)

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C. Translations [3 points each (24 points total)]

Translate each of the following English statements into the language of sentential logic. Use the first letters of the capitalized words in your translations. Letters should stand for positively stated sentences. For example, “John is not PRESIDENT” should be translated as ‘\(\sim P\)’.

13. If the YANKEES win the pennant, they will win the WORLD series.
   \[Y \rightarrow W\]

14. Only if the YANKEES win the pennant will they win the WORLD series.
   \[W \rightarrow Y\]

15. The RED Sox will win the pennant unless the YANKEES win it.
   \[\sim Y \rightarrow R\]

16. Neither the RED Sox nor the YANKEES will win the pennant.
   \[\sim R \land \sim Y\]

17. If either the RED Sox or the YANKEES win the pennant, then neither CHICAGO nor BALTIMORE will win the World Series.
   \[(R \lor Y) \rightarrow (\sim C \land \sim B)\]

18. If the RED Sox win the pennant, they will win the world SERIES, otherwise the Yankees will win the WORLD Series.
   \[(R \rightarrow S) \land (\sim R \rightarrow W)\]

19. ARIZONA will not win the World Series whether they win the PENNANT or not.
   \[(P \lor \sim P) \rightarrow \sim A\]
20. Either the YANKEES will win the pennant and the RED Sox will not, or the Red Sox will win the pennant and the Yankees will not, but they won’t both win the pennant.

\((Y \land \neg R) \lor (R \land \neg Y) \land \neg (Y \land R)\)

**D. Translations together with Truth Tables** [9 points each (18 points total)]

For each of the following arguments, translate the argument into sentential logic, and then construct a truth table to determine whether the argument is **valid** or **invalid**, and label it accordingly. Provide a complete truth table for each argument.

21. Unless John goes to the MOVIES, he won’t have a GOOD time. But if John FAILS his exam, he won’t have a good time, and he will fail his exam if he goes to the movies. So John won’t have a good time.

\((\neg M \to \neg G); (F \to \neg G) \land (M \to F) / \neg G\)

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**VALID**

22. The UNIVERSITY will expand only if the BUDGET increases. But the budget won’t increase unless the ECONOMY improves. So if the economy improves, the University will expand.

\((U \to B); (~E \to ~B) / (E \to U)\)

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