Logic—Sample Test B1

NAME _____

1. Define ‘counterexample’. (10 points)

2. Define ‘valid’. (20 points)

Translate the following sentences into the language of sentential logic using the abbreviations given to you. (These problems are worth 2 points each.)

G = “Jose will play goalkeeper.”
J = “Jose will play offense.”
D = “Dirk will play defense.”
S = “Kelli will show up.”
M = “Kelli will play midfield.”
K = “Kelli will play defense.”
O = “Walter will play offense.”
W = “Walter will play defense.”
Q = “Pete will play midfield.”
P = “Pete will play defense.”

3. “If Jose plays goalkeeper, then Dirk will play defense.”

4. “Unless Kelli doesn’t show up, Dirk won’t play defense.”

5. “Jose isn’t going to play goalkeeper, but he and Walter will play offense instead.”

6. “Kelli will play midfield only if she shows up and Pete doesn’t play defense.”

7. “Kelli and Pete will either both play midfielder together, or play defense together.”

8. “Both Dirk and Pete will not play defense, and neither will Kelli.”

9. “Unless Walter and Pete don’t both play defense, Jose won’t play goalkeeper.”

10. “Kelli will play either midfield or defense, unless she doesn’t show up.”

11. “Walter will play offense only if Jose doesn’t play offense or goalkeeper.”

12. “Kelli, Dirk, Pete and Walter are not all going to play defense.”

Suppose we add the symbol ‘≡’ to our logic and we define its truth table as

p	*q*	(*p* ≡ *q*)
T	T	T
F	T	F
T	F	F
F	F	T

Construct truth tables to test whether these arguments are valid or invalid. *In the case of an invalid argument indicate the row or rows that show that the argument is invalid by circling one of them.* (3 points each).

13. A ≡ ~B
B ⊃ A
~A

Which is it: valid or invalid?
(If it is invalid, circle any row that proves that it is invalid.)

Test whether each of these sentences is a tautology, a contradiction, or a contingent sentence by constructing their truth tables. (3 points each).

14. (J ≡ ~J)

Which is it: a tautology, a contradiction, or a contingent?

15. $(A \vee B) \supset (\sim A \equiv \sim B)$

Which is it: a tautology, a contradiction, or a contingent?

Use the truth tree method to determine whether the set of sentences is consistent. Number all lines. Label all derived lines with the rule and the line from which they were derived. Answers should look just as in the book (except that you should cross out each complex sentence after you use it). Complete the truth tree. (8 points each)

16. $\{ (I \ \& \sim T) \ \& \ Z, \sim I \supset \sim Z, \sim (Z \ \& \ I) \}$

17. { ~~~W, K & (B ∨ ~E), E ∨ ~(R ∨ ~(~T ⊃ B)) }

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Use the truth tree method to determine whether the argument is valid.
Number all lines. Label all derived lines with the rule and the line from which they were derived. Complete the truth tree. Label the argument as valid or invalid.
Answers should look just as in the book (except that you should cross out each complex sentence after you use it). (8 points each)

18. J

$A \supset (B \supset (C \supset (D \supset A)))$

19. $\sim Q \supset (A \ \& \ S)$
$\sim(\sim L \ \& \ R)$
$(R \ \& \ Q) \vee A$

$\sim\sim(A \vee (L \ \& \ Q))$

20. Using the given atomic sentences, translate the argument below into the language of propositional logic. Use the truth tree method to determine whether the argument is valid. Number all lines. Label all derived lines with the rule and the line from which they were derived. Complete the truth tree. Label the argument as valid or invalid. Answers should look just as in the book (except that you should cross out each complex sentence after you use it). (4 points for the translation; 5 points for the truth tree)

E = “Selma is enticed by your proposal.”
H = “Selma is hot.”
I = “Selma is irritated.”
D = “Selma will be delighted.”

Either Selma is hot and irritated or she is enticed by your proposal.
Selma will be both delighted and not irritated if she is enticed by your proposal.
Thus, Selma is enticed by your proposal if and only if she is irritated.