Dawson College: Principles of Mathematics and Logic: 360-124-DW-S02: Winter 2013

Name: Y. Lamontagne
Student ID: ____________

Test 1

No books, calculators, notes or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. *(2 marks)* Give a justification for the inclusion of a course on Principles of Mathematics and Logic in the Dawson College Liberal Arts program citing historical examples from liberal education.

- see slides.

Question 2.[1] Given the following symbolization key:
A: Alexander Berkman loves Emma Goldman
B_1: Alexander Berkman buys bread.
B_2: Emma Golman buys bread.
E: Emma Goldman loves Alexander Berkman.
F_1: Alexander Berkman buys flowers.
F_2: Emma Goldman buys flowers.
P_1: Alexander Berkman protests.
P_2: Emma Goldman protests.

Translate each English language statement into Propositional Logic.

a. *(3 marks)* Emma and Alexander protest only if, it is the case that both Emma buys flowers and Alexander buys bread.

b. *(3 marks)* Neither Alexander loves Emma nor Emma loves Alexander if, they do not both protest.

Translate each Propositional Logic statement into English.

c. *(1 mark)* $\neg F_2$

d. *(3 marks)* $(\neg F_2 \vee B_1) \iff A$

a) $(P_2 \wedge P_1) \rightarrow (F_2 \wedge B_1)$, b) $\neg(P_1 \wedge P_2) \rightarrow (\neg A \wedge \neg E)$

c) Emma Goldman does not buy flowers

d) Alexander Berkman buys bread or Emma Goldman does not buy flowers, if and only if Alexander loves Emma.

[1] not historically accurate

Question 3. *(6 marks)* Determine wether the following statement is a tautology, contradiction, or contingent statement. Justify your conclusion.

$\cancel{[(A \to B) \wedge (B \to C)] \to (A \to C)}$ $[(A \to B) \wedge (B \to \neg A)] \to (A \to \neg B) = \Phi$

A	B	¬A	¬B	$(A \to B)$	$(B \to \neg A)$	$(A \to B) \wedge (B \to \neg A)$	$(A \to \neg B)$	Φ
T	T	F	F	T	F	F	F	T
T	F	F	T	F	T	F	T	T
F	T	T	F	T	T	T	T	T
F	F	T	T	T	T	T	T	T

Question 4. *(6 marks)* Determine whether the following is a valid argument. Justify your conclusion.

$\neg F_2, (\neg F_2 \vee B_1) \iff A \therefore A$

The argument is valid since it is not possible to find a valuation where the premises are true and the conclusion is false.

That is if the conclusion is false, A is false. And the first premise is true, so $\neg F_2$ is true so F_2 is false.

It follows that if $\neg F_2$ is true then $(\neg F_2 \vee B_1)$ is true hence the second premise is false because A is false i.e. $(\neg F_2 \vee B_1) \Leftrightarrow A = T \Leftrightarrow F = F$.

Question 5. Which of the following is possible? If it is possible, give an example. If it is not possible, explain why.

a. *(3 marks)* A valid argument, the conclusion of which is a contradiction.

b. *(3 marks)* An invalid argument, the conclusion of which is a contradiction.

a) This is possible: $\neg A \land A \therefore \neg B \land B$

b) This is possible: $A \therefore \neg A \land A$

Bonus Question. *(1 mark)* Why did you choose to study Math ~~in the Liberal Arts program~~?

Because it is so cool!