

Concordia University Department of Computer Science & Software Engineering

SOEN331/W- Winter 2017 Introduction to Formal Methods for Software Engineering

Midterm 1 (15%)

Date: 24/01/2017

Instructor: Dr. Ormandjieva Duration: 70 minutes

Name:	No. 1	
Student ID:		

Notes:

- 1. This is a closed book and notes exam.
- 2. Write your answers in this exam paper
- 3. Write clearly your assumptions in the exam paper, if needed.

Special Instructions:

- Answer ALL questions
- Keep your answers short and precise
- Total 15 points

Total # of pages (including this cover page): 5

Question 1 (6 points)

Consider the argument given by the following sentences.

- P1. Either the computer is not intelligent or the program does not terminate
- P2. If the computer is not intelligent then the computer runs forever
- P3. If the program does not terminate then the alarm rings forever
- Q. Therefore, either the alarm rings forever or the computer runs forever.
- 1.1 Formalize the statement in propositional logic
- 1.2 Prove that Q is a logical consequence of the premises P1, P2, P3 using proof by contradiction technique seen in class

Question 2 (4 points)

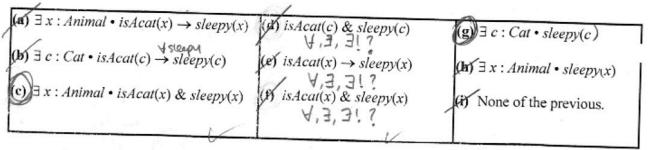
The following statements relate to computer accounts for students. Translate each sentence into a predicate logic formula:

- 2.1 Every student owns 200 MB of disk space.
- 2.2 No student can have two different disk spaces.
- 2.3 A student may give the disk space to some other student, but not to two students simultaneously.

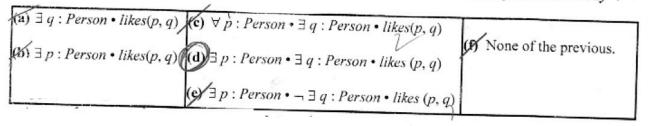
Question 3 (2 points. Circle the right answer(s))

3.1 Which of the following predicates are valid formalizations of "some cats are sleepy"?

Note: isAcat(x) is true if x is a cat.



3.2 Which of the following predicates are valid formalizations of "Somebody likes somebody"?



Question 4 (2 points)

Is Propositional Logic sound (consistent)? complete? Explain your answer.

Question 5 (1 points)

Given the following well-formed formulas:

- $(P \Rightarrow Q) \Rightarrow (Q \lor \neg P)$ $(P \lor Q) \land P$ 5.1
- 5.2
- $((P \Rightarrow Q) \lor P) \land \neg P$ 5.3

Which are tautologies? Use truth tables to prove your answer