CSC281: Discrete Math for Computer Science

Computer Science Department

First Semester 1442

King Saud University

Tutorial 1: Propositional and Predicate Logic

Question 1. Find a proposition for the given truth table:

p	q (914)	₹.P.Λαγ,	(19-1P)
Т	Т Т	F	F
T	F F	F	F
F	ΤF	Т	T
F	FF	F	F
		<u>.</u>	1

Question 2.

1. Write a proposition with three variables, which is true iff only one variable is true, and

2. Write a proposition with three variables, which is never true (unsatisfiable). $(\rho \land \neg \rho) \lor (q \land \neg q) \lor (r \land \neg r)$ Question 3. Determine whether $p \to (q \to r)$ and $(p \to q) \to r$ are equivalent.

Question 4. Determine whether the following propositions are tautologies, if yes, proof them using propositional equivalences:

Question 5. Write a proposition equivalent to $p \lor \neg q$ that uses only p, q, \neg , and the connective 7 (7P /9)

Question 6. Let the variable x represent students and y represent courses, with: F(x): x is a freshman, A(x): x is a part-time student, and T(x,y): x is taking y. Translate these statements into English:

 $1.\exists x(A(x) \land \neg F(x))$ Some part time students are not a freshmen

 $2. \forall x \; \exists y \; T(x,y) \qquad \textit{Every student is taking some course}$

 $3.\exists x \ \forall y \ T(x,y)$ There is a student who takes all courses

Question 7. Let p(m,n) mean $m \leq n$, where n and m are non-negative integers. Determine whether the following statements are true:

$$1.\forall n \ p(0,n)$$

$$2.\exists n \ \forall m \ p(m,n)$$

$$3.\forall m \ \exists n \ p(m,n)$$

$$(m \in \mathbb{N})$$

$$(m \in \mathbb{N})$$

Question 8. Let the variable x denote people, and S(x): x is smart, T(x): x is tall, and W(x): x is worried. Write these statements using the given predicates and any needed quantifiers:

1. Some people are not worried.

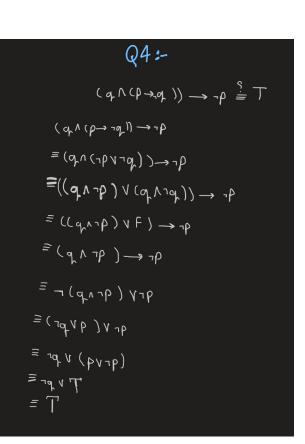
Non negative integer is the set of all integers without the negative integers. It includes 0 (zero) and other positive integers like +1, +2, +3... All the integers in this set are greater than or equal to 0.

Positive integers is the set of all integers greater than 0 (zero) and includes +1, +2, +3... All the integers in this set are strictly greater than 0.

- 2.All tall people are smart.
- 3.No smart people are worried. $\forall n (SU) \rightarrow W(D)$
- 4. Some people are tall and smart, but they are worried.



$P \to (q \to r) \stackrel{?}{=} (P \to q) \to r$								
P	of .	Υ .	P-94	(p-of) >r	q->r	\ p → (or → r)		
T	T	て	T	T	T	T		
T	T	F	T	F	F	F		
7	F	Τ	F	T	T	T		
Т	F	F	F	T	丁	1		
F	T	T	T	T	7	T		
F	一丁	F	Ī	F	F			
<u>_</u> F	F	T	T	丁	下			
<u>۴ </u>	F	F.	T	F	T			
They are not equivalent.								



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