Curtin University
Department of Computing
Quiz 1 – Semester 2, 2016

Subject: **Foundations of Computer Science 2001**
Index No.: COMP2001

Name:

Student ID:

Practical Time:

Time Allowed: **45 MINUTES**

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1. Represent the following statements in a propositional logic. You are required to define all necessary **propositions and predicates** used in your answers.

   (i) There is no largest positive integer.

   (ii) All students in this class can remember Antoni's full name.

   (iii) You will pass this quiz if you have attended all the lectures and tutorials.

   (iv) You cannot drive a car if you are not taller than 5 feet unless you are older than 20 years old

   (v) Every student in this class has a .unique student ID.

(5 marks)

2. State at least three approaches to prove: $p \rightarrow q$.

(5 marks)

3..

(a) Using the absorption rule

$$p \vee (p \wedge q) \equiv p; \; p \wedge (p \vee q) \equiv p$$

to prove the following assertion

$$(p \wedge (p \vee q \vee r)) \vee (p \wedge q \wedge r) \vee \neg p \equiv T \quad (Tautology)$$

(4 marks)

(b) **Prove or disprove** the following statements.

(i) If the sum of two numbers is positive, then both of them are positive. .

(ii) If Dr. Wanquan Liu is not teaching this unit (COMP2001) in this semester, I will get high distinction.

(iii) If $x \mod 8 \equiv 0$, then $\mathrm{x} \mod 4 \equiv \mathrm{x} \mod 2$

(6 marks)

4. Find the negations for the following propositions and **simplify them if possible.**

a) $\neg(\exists x \in D, \{(P(x) \vee Q(x)) \wedge R(x)\}) = ?$

b) $\neg(q \wedge (\neg p \vee q \vee r)) = ?$

c) $\neg(\forall \varepsilon > 0, \exists \delta > 0, (|x - x_0| < \delta \to |f(x) - f(x_0)| < \varepsilon)) = ?$

(5 marks)

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Rule of Inference

Rule of Inference	Tautology	Name
$\dfrac{p}{\therefore (p \vee q)}$	$p \rightarrow (p \vee q)$	Addition
$\dfrac{(p \wedge q)}{\therefore p}$	$(p \wedge q) \rightarrow p$	Simplification
$\dfrac{\begin{array}{c} p \\ p \rightarrow q \end{array}}{\therefore q}$	$[p \wedge (p \rightarrow q)] \rightarrow q$	Modus Ponens
$\dfrac{\begin{array}{c} \neg q \\ p \rightarrow q \end{array}}{\therefore \neg p}$	$[\neg q \wedge (p \rightarrow q)] \rightarrow \neg p$	Modus Tollens
$\dfrac{\begin{array}{c} p \rightarrow q \\ q \rightarrow r \end{array}}{\therefore p \rightarrow r}$	$[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$	Hypothetical syllogism
$\dfrac{\begin{array}{c} p \vee q \\ \neg p \end{array}}{\therefore q}$	$[(p \vee q) \wedge \neg p] \rightarrow q$	Disjunctive syllogism

$$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$$

$$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$$

$$(p \vee q) \vee r \equiv p \vee (q \vee r)$$

$$(p \wedge q) \wedge r \equiv p \wedge (q \wedge r)$$