Curtin University
Department of Computing
Quiz 1 – Semester 2, 2017

Subject: **Foundations of Computer Science 1006**
Index No.: COMP1006

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 smallest negative integer.

   (ii) I will pay the rent only if you fix the garage.

   (iii) All visitors to Australia from China need a visa.

   (iv) Every student in this class has a calculator or has a friend with a calculator.

   (v) There is only one student in department of computing can obtain the highest distinction.

(5 marks)

2. Prove the assertion: $(p \wedge r) \rightarrow q \equiv p \rightarrow (r \rightarrow q)$. **(4 marks)**

3. Using Mathematical Induction to prove that the sum of the first n odd positive integers is n^2

(4 marks)

4. **Justify whether** the following statements are true and give your justifications.

(1) $\exists\, x \in D,\ P(x) \wedge Q(x) \ \equiv (\exists\, x \in D,\ P(x)) \wedge (\exists\, x \in D,\ Q(x))$

(2) $\forall x \in D, (P(x) \wedge Q(x)) \equiv (\forall x \in D, P(x)) \wedge (\forall x \in D, Q(x))$

(3) If there is no COMP1006 unit in computing department, then everyone can obtain a bachelor degree in computer science.

(6 marks)

5. Find the negations for the following propositions or statements and **simplify them if possible.**

a) Some students have a laptop.

b) If you pass this quiz, I will give you award.

c) $\neg(\neg p \wedge (r \vee s \vee t \vee \neg p)) = ?$

d) $\neg(\exists \varepsilon > 0, \forall t > 0, (| x - d |< t) \wedge (| f(x) - f(d) |> \eta)) =$

(6 marks)

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Rule of Inference

Rule of Inference	Tautology	Name
p $\therefore (p \lor q)$	$p \to (p \lor q)$	Addition
$(p \land q)$ $\therefore p$	$(p \land q) \to p$	Simplification
p $p \to q$ $\therefore q$	$[p \land (p \to q)] \to q$	Modus Ponens
$\neg q$ $p \to q$ $\therefore \neg p$	$[\neg q \land (p \to q)] \to \neg p$	Modus Tollens
$p \to q$ $q \to r$ $\therefore p \to r$	$[(p \to q) \land (q \to r)]$ $\to (p \to r)$	Hypothetical syllogism
$p \lor q$ $\neg p$ $\therefore q$	$[(p \lor q) \land \neg p] \to q$	Disjunctive syllogism

$$p \lor (q \land r) \equiv (p \lor q) \land (p \lor r)$$

$$p \land (q \lor r) \equiv (p \land q) \lor (p \land r)$$

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

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