Curtin University
Department of Computing
Second Quiz – Semester 1, 2011

Subject: **Foundations of Computer Science 152**
Index No.:   **12332**

Name:………………………………………………….

Student ID:………………………………………………..

Practical Time:………………………………………………….

Time Allowed: 50 MINUTES, proceeded by a 5-MINUTE READING PERIOD during which time only notes may be made. The supervisor will indicate when answering may commence.

Aids Allowed:

To be supplied by the candidate:-   Nil
To be supplied by the University:-   Nil

General Instructions:

This test consists of 3 questions worth of 25 marks. Attempt <u>ALL</u> the questions. You may answer the questions in any order.

When answering the questions, use the space allocated for each question. In the unlikely event that you run out of space, use the additional space at the end of the test paper and clearly label your answer.

This test is worth 25% of the total marks for this unit.

Question 1 (8 marks total)

    (a) Given the Well Ordering property as below
        "**Every non-empty set of non-negative integers has a least element.**"

        Using above property, you are required to prove the following assertion: "If $P(1)$ **is true and** $\forall k\ P(k) \rightarrow P(k+1)$**, then P(n) is true for all positive integer n.**"

                                                 (5 marks)

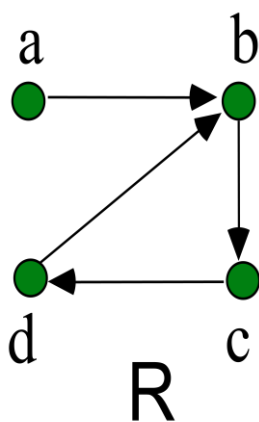(b) Given two sets A={a, {a}}, B={a, b, {a, b}}. Determine the following.
(3 marks)

A∪ B

P(A)

A ×B

Question 2 (5 marks total)

Let R a relation defined on a set A={a,b,c,d} and it is given below.
(5 marks)

Iteratively compute R^2 and R^4

Question 3 (12 marks total)

1) Determine whether the following function is one-to-one, onto or both.

F: $P(A) \times P(B) \rightarrow P(A \cup B)$
$F((X,Y)) = X \cup Y$,
where *A*={a,b}, *B*={c,d}

(5 marks)

2) How many bit strings of length 4 have exactly 2 ones (or exactly 2 zeros)? Justify your solution.   (2 marks)

3) (i) Find a recurrence relation for the number of to climb n stairs if the person climbing the stairs can take two or three stairs at a time.
  (ii) What are the initial conditions?
  (iii) How many ways can this person climb a flight of 4 stairs?
                                                              (5 marks)

End of Test