Curtin University
Department of Computing
Second Test – Semester 1, 2012

Subject: **Foundations of Computer Science 200**
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 exam consists of 3 questions worth of 30 marks. Attempt ALL 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.

Question 1 (10 marks total)

(a) Use the mathematical induction to prove for integers $n>4$, $2^n>n^2$.
(5 marks)

(b) Given two sets A={a, ϕ}, B={b, {a, b}, ϕ}. Determine the following sets. (5 marks)

A∩B

A∪ B

P(A)

A ×B

Question 2 (6 marks total)

(a) Prove that if R is a partial order on A, so is R^{-1}. (3 marks)

(b) Give set A={0, 1, 2}, and R={(0,1),(1,0),(2,1),(0,2),(2,0)}. Please answer the following questions (3 marks)

(i) Is R is reflexive? Justify your answer.

(ii) Compute R^3.

Question 3 (14 marks total)

(a) Let $f: \mathbf{R} \rightarrow \boldsymbol{R}^+$, $f(x) = x^2 + 1$ and $g: \mathbf{R} \rightarrow \boldsymbol{R}^+$, $g(x) = x - 2$. Determine the following functions and justify wether that they are one-to-one functions. ($\boldsymbol{R}^+ = \{x | x > 0\}$.)

(4 marks)

- $f+g$,

- $f \cdot g$

- $f \circ g$

(b) There are 15 students in a class of CS students including 10 male and 5 female students. Please answer the following questions.

(i) How many groups of seven can be chosen that contain 3 males and 4 females?

(ii) How many groups of seven can be chosen if two students must be together either in the group or not. (5 marks)

(c)Find a recurrence relation for the number of to climb n stairs if the person climbing the stairs can take one, two or three stairs at a time. (Use diagram to justify your reasoning)

(i) What are the initial conditions?
(ii)How many ways can this person climb a flight of 6 stairs?

End of Test