# 2006 Paper 5 Question 6

**Compiler Construction**

(a) Consider the grammar

$$S ::= (L) \mid a$$
$$L ::= L, S \mid S$$

    (i) Present a right-most derivation for the string $(a, ((a, a), (a, a)))$.

                          [3 marks]

    (ii) Present a left-most derivation for the same string $(a, ((a, a), (a, a)))$.

                          [3 marks]

(b) Automatic garbage collection is an important technique for the implementation of many programming languages. Define each of the following variations:

    (i) Mark and Sweep;                       [3 marks]

    (ii) Copy Collection;                      [3 marks]

    (iii) Generational Collection.                [3 marks]

(c) Write a small program that will produce different values depending on which kind of variable scoping mechanism is used, static or dynamic. Explain your answer. [5 marks]