2006 Paper 12 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]