Compiler Construction

(a) Consider the grammar

\[ S ::= (L) | a \]
\[ L ::= L, S | S \]

(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]