Solutions to Assignment 3 (?? marks)

5.1.2
(a)
(b)
(c)

5.1.3 To do this question we follow the inductive definition of regular expressions (see section 3.1.2). The Basis Case is easy: $\varepsilon, \emptyset$, and symbols a. The corresponding CFGs are the following: $G_\varepsilon = (\{S\}, \{\varepsilon\}, \{S \to \varepsilon\}, S)$, and ... `(you do the other two cases)`

Induction: If E, F are regular expressions, then so are $E + F$, EF, E^* and (E). Consider E^*. By induction, we already have a CFG for E, call it $G_E = (V_E, T_E, P_E, S_E)$. We now show how to construct a CFG G_{E^*} such that $L(E^*) = L(G_{E^*})$. Let:

$$G_{E^*} = (V_E \cup \{N\}, T_E, P_E \cup \{N \to NS_E|\varepsilon\}, N)$$

where N is a *new* variable. Note that by adding the production rule $N \to NS_E|\varepsilon$, we allow any number of repetitions of strings derived from S_E, which has the effect of allowing us to derive from N any string in $L(E^*)$. `(you do the other three cases)`.

5.2.1