CSE213 Fall2007

Solution: Exam 1

(1)(a)N (b)N (c) Closure
(d)Recursive: $S \rightarrow aS$ Nonrecursive: $S \rightarrow a$
(e) α is a single nonterminal.

(2) Basis: $0 \in S$
Inductive step: If $x \in S$ then $x + 6 \in S$

(3)Basis: $(0, 1, 2) \in P$
Induction: If $(x, y, z) \in P$ then $(x + 1, y + 1, z + 1), (x, y + 1, z + 1), (x, y, z + 1) \in P$.

(4)Two solutions:
Using concat: $concat(< head(L), head(L) >, dup(tail(L)))$
Using cons: $head(L) :: (head(L) :: dup(tail(L)))$

(5) $S \rightarrow 00A$
$A \rightarrow 0A$
$A \rightarrow 1A$
$A \rightarrow \Lambda$

(6)(i) $j = i + 1; i >= 0, k > 0$
(ii) bc
(iii) Derivation of string, $abbc$;
$S \Rightarrow ABC$
$S \Rightarrow aAbBC$
$S \Rightarrow abBC$
$S \Rightarrow abbC$
$S \Rightarrow abbc$

(7)(i) N
(ii) $\{0, 1\}^*$ contains Λ, while $L_0 \cup L_1$ does not. Because both L_0 and L_1 don't have Λ in them.

(8)(a) $B \subseteq C$
(b) If C does not have any element from A, then $B = C$. If it has some element from A, then $B \subset C$. Hence, $B \subseteq C$ always holds.