

CS 310T-31 - TPCS: Theory of Computation

Quiz 5 Answer Key

December 2, 2004

1. Give context-free grammars that generate the following languages. The alphabet Σ is $\{0, 1\}$

(a) $\{w \mid w \text{ starts and ends with different symbols}\}$

$A = (V, \Sigma, R, S)$ where,

$V = \{S, M\}$,

$\Sigma = \{0, 1\}$, and

$R = \{S \rightarrow 0M1 \mid 1M0,$

$M \rightarrow 0M \mid 1M \mid \epsilon\}$

(b) The set of strings with three times as many 1's than 0's

$B = (V, \Sigma, R, S)$ where,

$V = \{S\}$,

$\Sigma = \{0, 1\}$, and

$R = \{S \rightarrow S0111 \mid S1011 \mid S1101 \mid S1110 \mid$

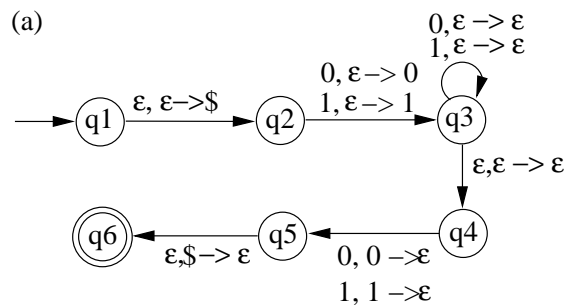
$0S111 \mid 1S011 \mid 1S101 \mid 1S110 \mid$

$01S11 \mid 10S11 \mid 11S01 \mid 11S10 \mid$

$011S1 \mid 101S1 \mid 110S1 \mid 111S0 \mid$

$0111S \mid 1011S \mid 1101S \mid 1110S \mid \epsilon\}$

2. Give state diagrams of PDA for the languages described above.



(b)

