BRAC UNIVERSITY
Merul Badda, Dhaka, Bangladesh
CSE331 : Automata and Computability
Assignment 4

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1. Draw the state diagram of a PDA for the following CFL:

A. $L(M) \rightarrow \{0^n 1^m \mid n, m \geq 0 \text{ and } 2n = 3m\}, \text{ where } \Sigma = \{0, 1\}$

B. $L(M) \rightarrow \{0^n 1^m 2^m 3^n \mid n, m > 0\}, \text{ where } \Sigma = \{0, 1, 2, 3\}$

C. $L(M) \rightarrow \{w = 0^i 1^j 2^k \mid i, j, k \geq 0 \text{ and } j < i + k\}, \text{ where } \Sigma = \{0, 1, 2\}$

D. $L(M) \rightarrow \{w_1 \# w_2 \mid \text{the number of } 00 \text{ in } w_1 \text{ is equal to the number of } 11 \text{ in } w_2\}, \text{ where } \Sigma = \{0, 1\}$

E. $L(M) \rightarrow \{w \# x \mid w^R \text{ is a substring of } x\}, \text{ where } \Sigma = \{0, 1\}$

2. Draw the state diagram of a TM that decides the following languages:

A. $L(M) \rightarrow \{w \in \Sigma^* \mid w \text{ contains equal numbers of 0s and 1s}\}, \text{ where } \Sigma = \{0, 1\}$

B. $L(M) \rightarrow \{0^n 1^n 2^n \mid n, m \geq 0\}, \text{ where } \Sigma = \{0, 1, 2\}$

C. $L(M) \rightarrow \{0^{2^n} \mid n \geq 0\}, \text{ where } \Sigma = \{0\}$

D. $L(M) \rightarrow \{w \in \Sigma^* \mid w \text{ is a palindrome}\}, \text{ where } \Sigma = \{0, 1\}$

3. Prove that the following languages are decidable.

A. $A_{DFA} \rightarrow \{\langle N, w \rangle \mid N \text{ is a NFA that accepts input string w}\}$

B. $A_{REX} \rightarrow \{\langle R, w \rangle \mid R \text{ is a regular expression that generates the string w}\}$