

# Theory of Computations

## Assignment 4

### Push Down Automata

#### Set 1

1. Design a PDA for accepting a language  $\{a^{2n}b^{3n} \mid n \geq 1\}$ .
2. Design a PDA for accepting a language that consists of strings of balanced left and right brackets For example,  $\{ \{ \{ \} \} \} \}$  should be accepted.
3. Design a PDA for accepting a language  $\{a^{n+m}b^n c^m \mid n, m \geq 1\}$ .

#### Set 2

##### 1. Given PDA defined as

$$Q = \{q_0, q_1, q_2\}$$

$$\Sigma = \{a, b\}$$

$$\Gamma = \{A\}$$

$$F = \{q_1, q_2\}$$

$$\delta(q_0, a, \epsilon) = \{[q_0, A]\}$$

$$\delta(q_0, \epsilon, \epsilon) = \{[q_1, \epsilon]\}$$

$$\delta(q_0, b, A) = \{[q_2, \epsilon]\}$$

$$\delta(q_1, \epsilon, A) = \{[q_1, \epsilon]\}$$

$$\delta(q_2, b, A) = \{[q_2, \epsilon]\}$$

$$\delta(q_2, \epsilon, A) = \{[q_2, \epsilon]\}$$

- Draw the state diagram of M.
- Show if the following inputs are accepted or rejected by the given PDA (provide tracing)
  - aabb
  - aaab

##### 2. Given PDA defined as

$$Q = \{q_0, q_1\}$$

$$\Sigma = \{a, b, c\}$$

$$\Gamma = \{A, B\}$$

$$F = \{q_1\}$$

$$\delta(q_0, a, \lambda) = \{[q_0, A]\}$$

$$\delta(q_0, b, \lambda) = \{[q_0, B]\}$$

$$\delta(q_0, c, \lambda) = \{[q_1, \lambda]\}$$

$$\delta(q_1, a, A) = \{[q_1, \lambda]\}$$

$$\delta(q_1, b, B) = \{[q_1, \lambda]\}$$

- Draw the state diagram of M.
- Show if the following inputs are accepted or rejected by the given PDA (provide tracing)
  - bbcbb
  - aacbb

Submission :

- Deadline is Sunday 13-June @11:59PM
- The assignment is individual.
- Cheating could lead to serious consequences.