

Homework – 6

1. Consider the pushdown automata $M = (K, \Sigma, \Gamma, \Delta, s, F)$, where

$$K = \{s, f\},$$

$$F = \{f\},$$

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

$$\Gamma = \{a\},$$

$$\Delta = \{((s, a, e), (s, a)), ((s, b, e), (s, a)), ((s, a, e), (f, e)), ((f, a, a), (f, e)), ((f, b, a), (f, e))\}.$$

a). Trace all possible sequence of transitions of M on input aba

①

$$(s, aba, e) \xrightarrow{t_m} (s, ba, a)$$

$$\xrightarrow{t_m} (s, a, aa)$$

$$\xrightarrow{t_m} (f, e, aa)$$

②

$$(s, aba, e) \xrightarrow{t_m} (f, ba, e)$$

$$\xrightarrow{t_m} (f, a,)$$

no transition as stack element does not match

③

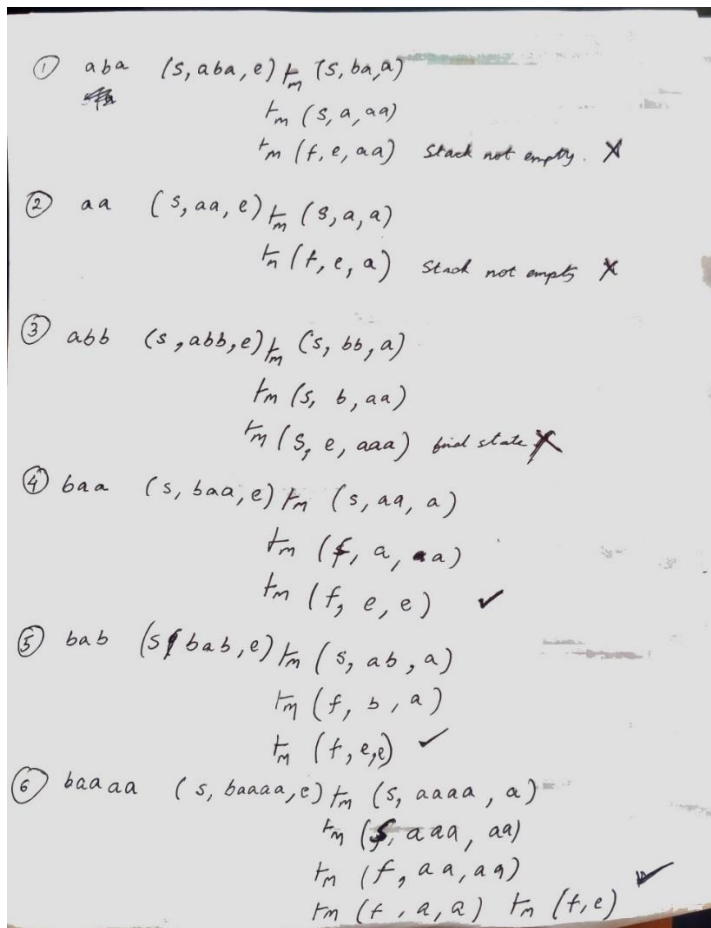
$$(s, aba, e) \xrightarrow{t_m} (s, ba, a)$$

$$\xrightarrow{t_m} (s, a, aa)$$

$$\xrightarrow{t_m} (f, a, aa)$$

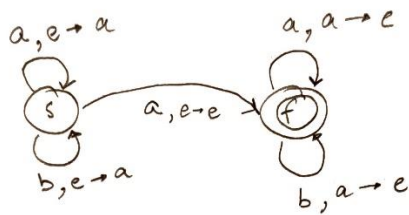
Ans.

b). Show that $aba, aa, abb \notin L(M)$, but $baa, bab, baaaa \in L(M)$



As shown in the picture above, the $aba, aa, abb \notin L(M)$, but $baa, bab, baaaa \in L(M)$

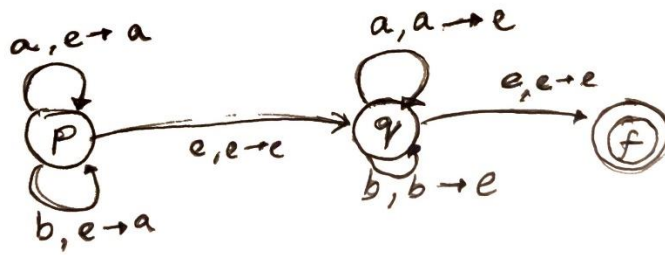
c). Describe $L(M)$ in English



$$L = \{ waw' \mid w, w' \in \{a, b\}^*, |w| = |w'| \}$$

2. Construct a Pushdown automata that accept each of the followings:

a). The language $\{w \in \{a,b\}^* : w = w^R\}$



b). The language $\{w \in \{a,b\}^* : w \text{ has the same number of } a\text{'s and } b\text{'s}\}$

