Institute Of Technology, Nirma University

B.Tech. (CSE) Sem VI

2CS601 Theory of Computation

Tutorial 8 (Push Down Automata)

Q-1 Design PDA for the following:

1. $L_1 = \{a^m c b^m \mid m \geq = 0\}$
2. $L_2 = \{a^m b^m c \mid m \geq = 0\}$
3. $L_3 = \{c a^m b^m \mid m \geq = 0\}$
4. $L_4 = \{a^n c b^m \mid n,\ m \geq = 0\}$
5. $L_5 = \{a^n b^m c \mid n,\ m \geq = 0\}$
6. $L_6 = \{ c a^n b^m \mid n,\ m \geq = 0\}$
7. $L_7 = \{a^n c b^m \mid n,\ m \geq = 1\}$
8. $L_8 = \{a^n b^m c \mid n,\ m \geq = 1\}$
9. $L_9 = \{ c a^n b^m \mid n,\ m \geq = 1\}$
10. More number of a's than b's
11. $L = \{a^n b^{2n} \mid n \geq 1\}$
12. $L = \{a^n b^m c \mid n \geq 1\}$

Q-2 Design PDA for the following CFGs and trance the string 0001101110

1. $S \rightarrow 0B \mid 1A$
   $A \rightarrow 0S \mid 1AA \mid 0$
   $B \rightarrow 1S \mid 0BB \mid 1$

2. $S \rightarrow b \mid bS \mid aSS \mid SSa \mid SaS$

Q-3 Give PDA for the following CFG and trace the string 01010101

$S \rightarrow XSX \mid Y$
$X \rightarrow 0 \mid 1$
$Y \rightarrow 0Z1 \mid 1Z0$
$Z \rightarrow XZX \mid X$

Q-4 Give a CFG for the following PDA

1. $\delta(q_0, a, Z_0) \vdash (q_0, aZ_0)$
   $\delta(q_0, a, a) \vdash (q_0, aa)$
   $\delta(q_0, c, a) \vdash (q_1, a)$
   $\delta(q_1, a, a) \vdash (q_2, \epsilon)$
   $\delta(q_2, a, a) \vdash (q_2, \epsilon)$
   $\delta(q_2, \epsilon, Z_0) \vdash (q_2, \epsilon)$

2. $\delta(q_0, 1, Z_0) \vdash (q_0, KZ_0)$
$\delta(q_0, \epsilon, Z_0) \vdash (q_0, \epsilon)$
$\delta(q_0, 1, K) \vdash (q_0, KK)$
$\delta(q_0, 0, K) \vdash (q_1, K)$
$\delta(q_1, 0, K) \vdash (q_1, \epsilon)$
$\delta(q_1, 0, Z_0) \vdash (q_0, Z_0)$

3.

Move Number	State	Input	Stack Symbol	Move(s)
1	q_0	a	Z_0	(q_0, AZ_0)
2	q_0	b	Z_0	(q_0, BZ_0)
3	q_0	a	A	(q_0, AA)
4	q_0	b	A	(q_0, BA)
5	q_0	a	B	(q_0, AB)
6	q_0	b	B	(q_0, BB)
7	q_0	c	Z_0	(q_1, Z_0)
8	q_0	c	A	(q_1, A)
9	q_0	c	B	(q_1, B)
10	q_1	a	A	(q_1, Λ)
11	q_1	b	B	(q_1, Λ)
12	q_1	Λ	Z_0	(q_1, Λ)

Q:5 Design a PDA for Odd length and Even length palindrome and trace the strings: aabbaa, abcba and aaabbb.

Q:6 In both cases below, a transition table is given for a PDA with initial state q_0 and Accepting state q_2. Describe in each case the language that is accepted.

Move Number	State	Input	Stack Symbol	Move(s)
1	q_0	a	Z_0	(q_0, XZ_0)
2	q_0	b	Z_0	(q_0, XZ_0)
3	q_0	a	X	(q_0, XX)
4	q_0	b	X	(q_0, XX)
5	q_0	c	X	(q_1, X)
6	q_0	c	Z_0	(q_1, Z_0)
7	q_1	a	X	(q_1, Λ)
8	q_1	b	X	(q_1, Λ)
9	q_1	Λ	Z_0	(q_2, Z_0)