Tutorial Sheet – X
(Language and Grammar)

1. Consider the words $u = a^3bab^2$ and $v = baba^2$. Find:
   (i) uvu (ii) λu (iii) λv (iv) $u\lambda v$ (v) $|\lambda|$ (vi) $|u|$ (vii) $|uvu|$
2. Consider the language $L = \{ab, c\}$ over $A = \{a, b, c\}$. Find:
   (i) L^0 (ii) L^2 (iii) L^{-1}
3. For the finite state machine M given in the table A, find out the string among the following strings, which are accepted by M : (a) 101101 (b) 11111 (c) 000000

	Inputs	
States	0	1
q_0	q_2	q_1
q_1	q_3	q_0
q_2	q_0	q_3
q_3	q_1	q_2

Accepting states are q_0, q_2

Table A

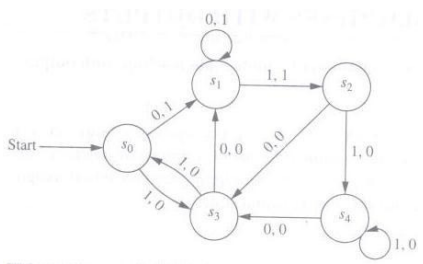
	Inputs	
States	a	b
s_0	s_0	s_1
s_1	s_1	s_2
s_2	s_2	s_2

Table B

4. Let M be the automaton with the following input set A, state set S , and accepting or final ("yes") state set Y : $A = \{a, b\}$, $S = \{s_0, s_1, s_2\}$, $Y = \{s_1\}$. Suppose s_0 is the initial state of M , and next state function F of M is given by the table B. Draw the state diagram $D = D(M)$ of the automaton M .
5. Construct the state diagram for the finite-state machine with the state table shown below**.**
6. Construct the state table for the finite-state machine with the state diagram shown in **Figure 1.**

F	Inputs	
States	0	1
s_0	$s_1, 1$	$s_0, 0$
s_1	$s_3, 1$	$s_0, 1$
s_2	$s_1, 0$	$s_2, 1$
s_3	$s_2, 0$	$s_1, 0$

Table C



7. Find the output string generated by the finite state machine in **Figure 1** if the input string is
   (i) 000000 (ii) 111111 (iii) 101011 (iv) 110101
8. Describe the language $L = L(G)$, where G has the productions $S \to aSb, Sb \to bA, abA \to c$.