

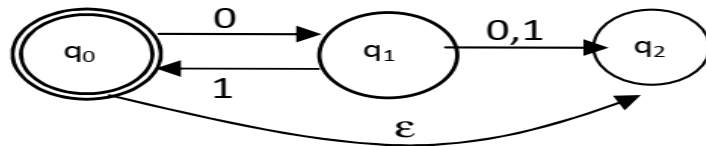
## UNIT-1

1. a) What is a state and write about few types of states? (4M)  
b) What is a string? Write about concatenation of two strings? (3M)  
c) Write the design strategy for NFA- $\Sigma$ ? (4M)  
d) Write about unreachable and dead states with illustration? (4M)
2. a) What is a transition? How are they represented? (4M)  
b) What is Kleene Closure and Positive Closure? (4M)  
c) What are the advantages of NFA over DFA? (3M)  
d) Differentiate DFA and 2DFA? (4M)  
e) Bring out the differences between Moore and Mealy machines? (4M)
3. a) What is a state transition table? (3M)  
b) Consider a language  $L^*$  where  $L = \{ab, cd\}$  with  $\Sigma = \{a, b\}$ . What is the shortest string in  $\Sigma^*$  that is not in the language  $L^*$ ? (4M)  
c) Write the design strategy for DFA? (4M)  
d) Write the procedure to detect indistinguishable state? (4M)
4. a) What is a state diagram? (3M)  
b) What is a formal language? Write the ways in which formal language can be specified? (4M)  
c) Write the design strategy for NFA? (4M)  
d) Write about indistinguishable and distinguishable states with illustration? (4M)
5. a) Explain the design of a finite state machine with an example? (10M)  
b) Explain the advantages of Finite State Machine? (6M)
6. a) Write the Algorithm for minimizing DFA? (4M)  
b) Reduce the following DFA where  $q_1$  is the start state and  $q_6$  is the final state.

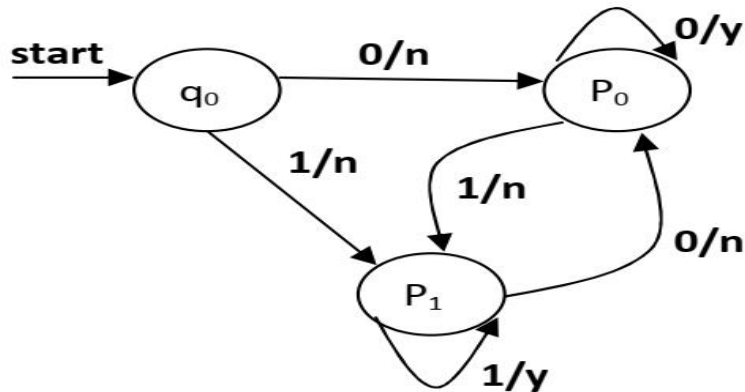
$\delta$	0	1
$q_1$	$q_2$	$q_3$
$q_2$	$q_4$	$q_5$
$q_3$	$q_6$	$q_7$
$q_4$	$q_4$	$q_5$
$q_5$	$q_6$	$q_7$
$q_6$	$q_4$	$q_5$
$q_7$	$q_6$	$q_7$

7. a) What is NFA? Explain the transitions of NFA? (4M)  
b) Construct an NFA that accepts the set of all strings over  $\{0,1\}$  that start with 0 or 1 and end with 10 or 01. (5M)

c) Construct a DFA equivalent to the NFA given below (7M)



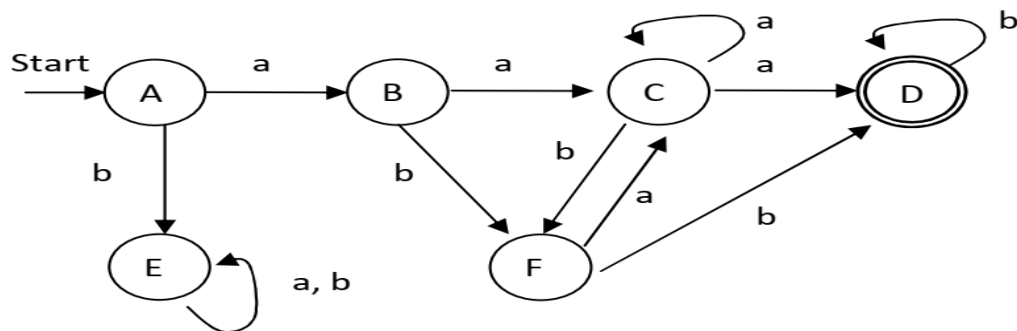
8. a) Convert the following Mealy machine to an equivalent Moore machine (8M)



9. a) Write about the Mathematical representation of Finite State Machine FSM? (8M)

b) Explain the applications of Finite State Machine in real world? (8M)

10. a) Reduce the DFA given below (6M)

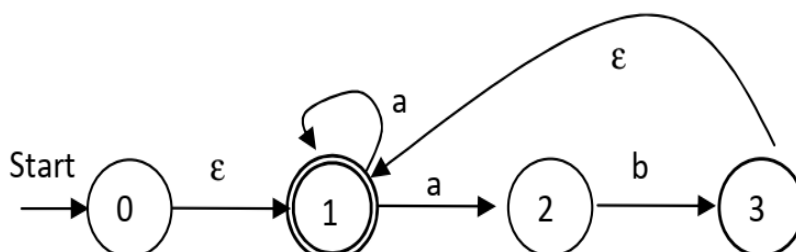


11. a) What is DFA? Explain the transitions of DFA? (4M)

b) Construct a DFA accepting the language

$\{ W \in \{a,b\}^* \mid W \text{ has neither } aa \text{ nor } bb \text{ as substring} \}$  (5M)

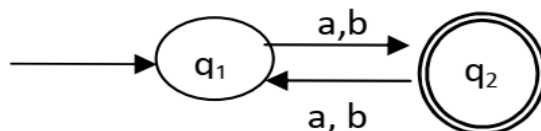
c) Convert the following NFA- $\Sigma$  to NFA (7M)



12. a) What is Automata? Explain classification of Automata? (8M)  
b) Write in detail about Models of Computation? (8M)
13. a) Construct a DFA accepting the language ;  $\{ \in \{ \}^*, = w b a w \}$  has neither aa nor bb as substring (8M)
14. a) Design a mealy machine to print out 1's complement of an input bit string? (8M)
15. a) What are the components of Finite state Automata? Give examples of Finite state machine? (8M)  
b) Explain the disadvantages of Finite State Machine? (8M)
16. What is minimal DFA? Write the minimization Algorithm for DFA? (4M)
17. Design a Mealy machine to add two binary numbers of the form  $x_1x_2...x_k, y_1y_2...y_k$ ? (8M)

## UNIT-2

1. a) Construct an NFA with  $\sum$  moves for  $00^*+1$  (6M)  
b) Write the steps to construct regular expression from given DFA? (4M)
2. Construct an NFA for  $r = (a+bb)^*ba^*$  (8M)
3. a) Discuss the properties of Regular Expressions and Regular Languages. (8M)  
b) State and prove Arden's theorem. (8M)
4. a) Construct an NFA for the regular expression  $(a+b)^*(aa+bb)(a+b)^*$  (6M)  
b) Construct a regular expression for the given transition diagram (6M)



5. Construct a NFA equivalent to the regular expression  $(10+11)^*00$ . (8M)
6. Explain Pumping Lemma. Also discuss the applications of PL. (8M)

### Unit-3

1. a) What is a context free Language? Give examples? Write about the properties of context free languages? (8M)
2. a) Write about Leftmost derivation and rightmost derivation with example? (4M)
3. a) Obtain a grammar to generate the language  $L = \{a^i b^j c^k \mid i+2j=k, i \geq 0, j \geq 0\}$  (8M)  
b) Simplify the following CFG and Convert it into CNF  
 $S \rightarrow AaB \mid aaB$   
 $A \rightarrow \Sigma$   
 $B \rightarrow bbA \mid \Sigma$  (8M)
4. a) Design a Turing Machine “Parantheses Checker” that outputs 1 or 0 depending on whether the sequence is properly formed or not? (8M)  
b) What is Halting Problem of Turing Machine? Is it decidable or not? Explain? (8M)
5. Differentiate ambiguous and unambiguous grammar with example? (4M)
6. a) Write in detail the Chomsky hierarchy of formal languages? (8M)  
b) Show that the language  $L = \{a^n b^n c^n \mid n \geq 0\}$  is not context free. (8M)
7. Write the general procedure to transform a grammar to Greibach Normal Form? (8M)
8. Write the general procedure to transform a grammar to Chomsky Normal Form? (4M)
9. a) What are formal languages? Write about the different types of formal languages? (8M)  
b) Show that  $L = \{a_p \mid p \text{ is prime}\}$  is generated with context sensitive grammar? (8M)
10. Explain different types of grammar with example? (8M)

#### UNIT-4

1. a) Explain about offline Turing Machine? (3M)  
b) Explain about Multi Dimensional Turing Machine? (3M)  
c) Explain Church Turing Thesis? (3M)
2. b) Show that  $L = \{a^n \mid n \geq 0\}$  can be generated with unrestricted grammar? (8M)
3. a) Design a Turing Machine to compute  $\text{Max}(n_1, n_2)$ ? (8M)  
b) Explain about Universal Turing Machine? (8M)
4. Explain about Multi Head Turing Machine? (3M)
5. a) Design a Turing Machine to accept the language  $L = \{W W_R \mid W \in (a+b)^*\}$  (10M)  
b) Differentiate Turing Machines and Real Machines? (6M)
6. . a) Design a Turing Machine “Parity Counter” that outputs 0 or 1, depending on whether the number of 1’s in the input sequence is even or odd respectively.  
(10M)  
b) What are P and NP class of Languages? What is NP Complete and give examples? (6M)
- 7.