QUESTION BANK

Sub: Theory of Computation

UNIT-I

Finite Automata

1. Define the following terms with proper examples. 8M
   a. Symbols
   b. Alphabets
   c. String
   d. Language
2. Define the following terms with proper examples. 10M
   a. DFA,
   b. NFA
   c. ε-NFA
   d. ε closure
   e. Kleen Closure
3. Design DFA accepting the language over the alphabet 0,1 that have the set of all strings with 011 as a substring. 4M
4. Design DFA accepting the language over the alphabet 0,1 that have the set of all strings whose 3rd symbol from the right end is 1. 4M
5. Design DFA accepting the language over the alphabet 0,1 that have the set of all strings that either begins or end (or both) with 01. 5M
6. Design DFA which accepts binary number divisible by 3. 5M
7. Design DFA over 0,1 that: 6M
   a. Ending with 10
   b. Ending with 11
   c. Ending with 1
8. Design DFA for set of strings over {a,b} in which there are at least two occurrences of b between any two occurrences of a. 6M
9. Design DFA for set of strings over {0,1} not ending with 010. 4M
10. Design a DFA that reads strings made up of letters in the word 'CHARIOT' and recognizes these strings that contain the word 'CAT' as a substring. 5M
11. Design a DFA for set of all strings over {a,b} ending in either ab or ba. 4M
12. Construct NFA and DFA for the following Languages 12M
    i. L = {x Є{a,b,c}* : x contains exactly one b immediately following c}
    ii. L = {x Є {0,1} *: x is starting with 1 and |x|is divisible by 3}
    iii. L = {x Є{a,b}* : x contains any number of a's followed by at least one b}
13. Construct a NFA that accept the set of strings in (0+1) * such that some two 0's is separated by string whose length is 4i, for some i>=0. 5M
14. The transition table of a NFA 'M' is given below. Construct a DFA equivalent to 'M'. δ is 6M

	0	1	2
→ q0	{q1,q4}	{q4}	{q2,q3}
q1	-	{q4}	-
q2	-	-	{q2,q3}
q3	-	{q4}	-
q4*	-	-	-

15. Convert the following NFA to DFA 6M

	0	1
→ p	{q,s}	{q}
q*	{r}	{q,r}
r	{s}	{p}
s*	ϕ	{p}

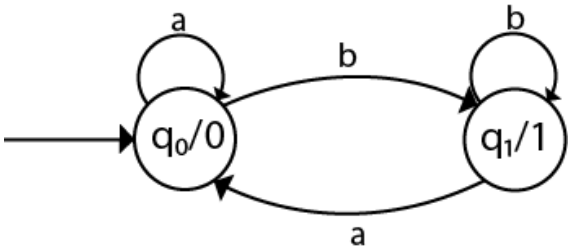
16. Convert following NFA with € moves into DFA (direct method) 6M

State/input	δ			
	ε	A	B	C
➔ p	{q}	{p}	ϕ	ϕ
q	{r}	ϕ	{q}	ϕ
* r	ϕ	ϕ	ϕ	{r}

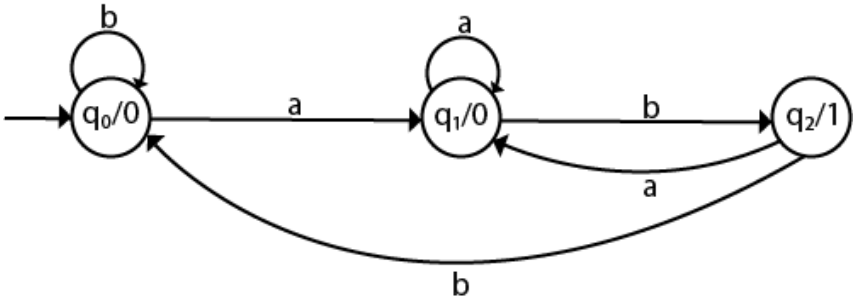
17. Consider the following ε–NFA. Compute the ε–closure of each state and find it's equivalent DFA. (direct method) 6M

	ε	a	b	c
p	ϕ	{p}	{q}	ϕ
q	{p}	{q}	{r}	ϕ
*r	{q}	{r}	ϕ	{p}

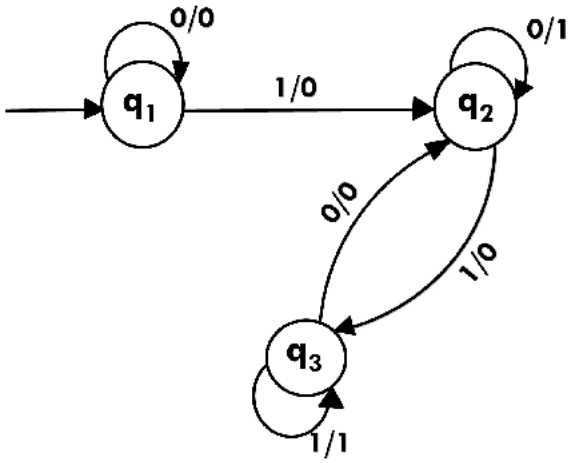
18. Construct Moore Machine to calculate 2's complement of binary number. 3M
19. Construct Moore machine for input from (0+1) * , if input ends in 101 , gives output x, if input ends in 110, gives output y, otherwise output z. 6M
20. Construct Mealy machine to increment binary number by 1. 3M
21. Construct Mealy machine to read sequence made up of vowels of English language which gives output in same sequence except the case where a 'i' follows 'e' should be changed to 'u'. 6M
22. Convert the following Moore machine into its equivalent Mealy machine. 4M



23. Convert the following Moore machine into its equivalent Mealy machine. 4M



24. Convert the following Mealy machine into equivalent Moore machine. 5M



25. Convert the following Mealy machine into equivalent Moore machine. 5M

Present State	Next State			
	a=0		a=1	
	State	Output	State	Output
q1	q1	1	q2	0
q2	q4	1	q4	1
q3	q2	1	q3	1
q4	q3	0	q1	1