Course : B.Tech. **Branch :** CSE-A& B **Year/Semester :** II/II **Academic Year :** 2017-18

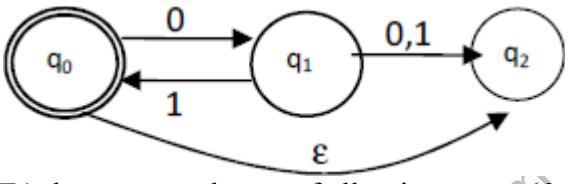
Subject : FLAT **Admitted Batch :** 2017

QUESTION BANK

Unit I : Finite Automata

1. a. What is finite Automation and explain in detail about Acceptance of a String by a Finite Automation [4 M]
   b.Construct a DFA accepting the language [6 M]
   { W Î {a,b}* | W has neither aa nor bb as substring}

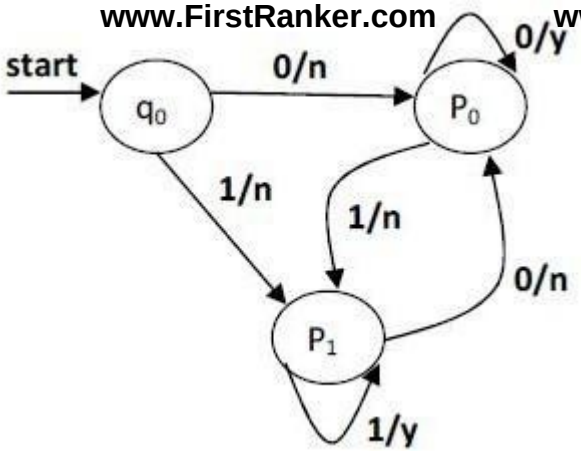
2. a. Construct a DFA to accept the language L={w/w has both an even number of 0's and even number of 1's}. [5 M]
   b. Construct a DFA equivalent to the NFA given below



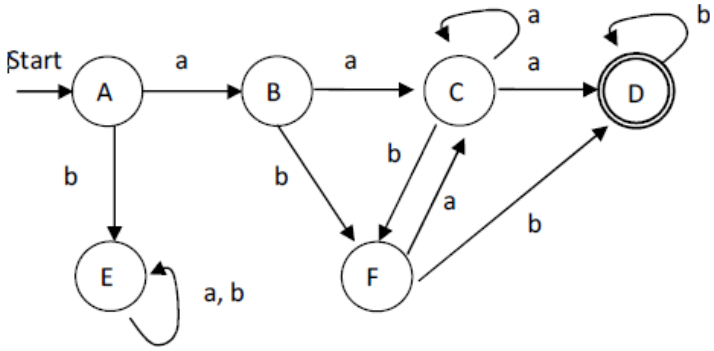
3. a. Construct an NFA that accepts the set of all strings over {0,1} that start with 0 or 1 and end with 10 or 01. [5 M]
   b. What is minimal DFA? Write the minimization Algorithm for DFA? [5 M]
4. a. Construct a Deterministic Finite State Automata equivalent to the NFA given below M={(q0,q1,q2,q3), {0,1} , §,q0, { q3}} where _ is defined by the following transition table [6 M]

§	0	1
q_0	(q_0, q_1)	(q_0)
q_1	(q_2)	(q_1)
q_2	(q_3)	(q_3)
q_3	Null	(q_2)

   b. Convert NFA to DFA with suitable example? [4 M]
5. a. Design a Moore machine that accepts all strings of 0's and 1's treated as binary integer number return a remainder 1 when divided by 3. [5 M]
   b. Design a mealy machine to print out 1's complement of an input bit string? [5 M]
6. a. Convert the following Mealy machine to an equivalent Moore machine [5 M]



b. Reduce the DFA given below [5 M]



Unit II :Regular Expressions

1. a. Construct an NFA equivalent to the regular expression 1*0+1101 and (0+1)*. [5 M]
   b. Convert the following regular expression into NFA with ∈ transition. [5 M]
   i) 1*0+1101 ii) (0+1)*
2. a. Write the steps to construct regular expression from given DFA? [4 M]
   b. Construct a regular expression corresponding to the DFA represented by the below transition table. q_1 is both the initial state and final state. [6 M]

δ	0	1
q_1	q_1	q_2
q_2	q_3	q_2
q_3	q_1	q_2

3. a. Construct the regular grammar to generate the following Language L={ $a^n b^m$ | n,m >=1} [6 M]
   b. Prove that regular sets are closed under union and complementation [4 M]
4. a. Define the DFA and regular expression. DFA accepts all strings corresponding to the expression 1*01(0+11)*. Also explain how to convert DFA to regular expression by eliminating states. [6 M]
   b) Give an example to explain the Relation between Regular Grammar and Finite Automata? [4 M]

5. a. Construct a Non Deterministic Finite automaton (NDFA) with ∈-moves for the regular expression (10+11)*00. [5 M]
   b. Give the properties of regular expressions and state and prove Arden‟s theorem. [5 M]

Unit III : Context Free Grammars

1. a. What is a context free Language? Give examples? Write about the properties of context free languages? [4 M]
   b. Simplify the following CFG and Convert it into CNF [6 M]
   S -> AaB | aaB
   A -> ε
   B -> bbA | ε
2. a. Write the general procedure to transform a grammar to Greibach Normal Form? [5 M]
   b. Prove that S -> aSbS | bSaS | ε is ambiguous. [5 M]
3. Remove all ∈ and unit production rules from the following CFG [10 M]
   S □AaA/ CA/ BaB
   A □aaBa/ CDA / aa / DC
   B □bB / bAB / bb/ aS
   C □Ca / bc / D
   D □bD / A
4. a. Construct a Greibach Normal Form grammar equivalent to the following CFG[5 M] S□ AA / 0
   A □SS / 1
   b. Prove that the following grammar of arithmetic expression is ambiguous. [5 M]
   E□ E+E / E*E / (E) / (id)
5. a.Consider the CFG with the following production rules: [5 M]
   S □aB/ bA
   A □bAA / aS/ a
   B□aBB / bS/ b
   Give the right most derivation and draw derivation tree for the string *abbaab*
   b. Find a Greibach normal form grammar equivalent to the following CFG. [5 M]
   S□ASB/ AB
   A□a
   B□b
6. a. Convert the following grammar into Chomsky Normal Form. [6 M]
   S□aB/ bA
   A□bAA / aS/ a
   B □aBB / bS/ b
   b. What is pumping lema and explain with proper example? [4 M]

Unit IV : Pushdown Automata

1. a. What is push down automata? Show how context free languages accepted by push down automata? [5 M]
   b. Explain in detail about language acceptance of push down automata? [5 M]
2. a. Explain about deterministic pushdown automata with example? [5 M]
   b. Explain about two stack push down automata? [5 M]
3. a. Illustrate about non-deterministic pushdown automata with example? [6 M]
   b. Applications of pushdown automata? [4 M]
4. a. Explain about equivalence of pushdown automata and context free grammar with example?
   b. Explain in detail about Conversion of CFG ?

Unit V: Turning Machine

1. a. Define Turing Machine and explain Transition tables and transition diagrams? [4 M]
   b. Design a Turing Machine to accept the language L = {W W^R | W∈ (a+b)*} [6 M]
2. a. Design a Turing Machine to recognize the language L={ $1^n2^n3^n$ | n>=1} [5 M]
   b. Design a Turing Machine to compute Max(n_1, n_2)? [5 M]
3. a. Design a Turing machine that accepts the language L ={ WW^R / W∈ (0+1)* and W^R is reverse of W} [5 M]
   b. Design a Turing machine to accept the set of al palindrome over {0,1}*. Draw a transition diagram for the Turing machine of the above. [5 M]
4. Design a Turing Machine which can multiply two positive integers [10 M]
5. 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. [10 M]
6. A. Explain about Universal Turing Machine? [5 M]
   b. Differentiate Turing Machines and Real Machines? [5 M]

Unit VI : Computability

1. a. What is Halting Problem of Turing Machine? Is it decidable or not? Explain? [5 M]
   b. What is post correspondence problem? Explain with an example. [5 M]
2. a. Explain about classes of P and NP? [5 M]
   b. Explain about classes of NP-hard and NP-complete problems? [5 M]
3. a. Give examples of decidable and an un-decidable problem. [5 M]
   b. Explain about modified post correspondence problem? Explain with an example. [5 M]

Signature of the Faculty **Head Of The Department**