Printed Pages: 02 **Sub Code:RCA203**

Paper Id: 214235 **Roll No.** | | | | | | | | | | |

MCA

(SEM II) THEORY EXAMINATION 2018-19

INTRODUCTION TO AUTOMATA THEORY & LANGUAGES

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a. Define finite automata (FA)
b. State the difference between NFA and DFA.
c. Write regular expression for the set of strings over {0,1}.
d. State Arden's theorem.
e. What is null and unit production?
f. Define grammar.
g. What is Turing machine?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Construct a NFA to DFA that given below :
Where q_0 is starting state and q_3 is final state.

State\ inputs	0	1
q_0	q_1, q_2	q_1
q_1	q_2	q_1, q_2
q_2	q_3	q_0
q_3	-	q_0

b. Using the pumping lemma to show L={a^p / p is a prime no. } is not regular.
c. Reduce the following grammar to Chomsky normal form (CNF)
S→aAD
A→aB/ bAB
B→b
D→d
d. Find the language generated by a grammar G=({S},{0,1},{S→ 0S1, S→ 01},S)
e. Define a push down automata (PDA). Is the language of Deterministic PDA and Non – deterministic PDA same? Describe it.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Prove that for every NDFA accepting a language L there exist an equivalent DFA accepting the same language L.
(b) Using pumping lemma to show that the language L={ $a^nb^nc^n$ | n>=1} is not a CFL.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain halting problems of Turing machine with one example.
(b) Explain post correspondence problem with an example.

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Construct a transition system of finite automata equivalent to the regular expression 10+(00+11)0*1 .

(b) Construct a regular expression of finite automata which is given below :
Where q_1 is starting state as well as final state.

State\ inputs	a	b
q_1	q_2	q_3
q_2	q_4	q_1
q_3	q_1	q_4
q_4	q4	q_4

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Design a Turing Machine to accept the language $L=\{a^nb^n / n>=1\}$.

(b) Show that union of recursive languages is recursive.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Define mealy and Moore machine. Explain the procedure for transforming a Moore machine to corresponding Mealy machine.

(b) Write short notes on :
(i) Greibach Normal Form.
(ii) NP-hard and NP-complete problems.