

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 $L = \{a^p \mid p \text{ is a prime no.}\}$ is not regular.
- c. Reduce the following grammar to Chomsky normal form (CNF)
 $S \rightarrow aAD$
 $A \rightarrow aB \mid bAB$
 $B \rightarrow b$
 $D \rightarrow d$
- d. Find the language generated by a grammar $G = (\{S\}, \{0,1\}, \{S \rightarrow 0S1, S \rightarrow 01\}, S)$
- 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 NFA accepting a language L there exist an equivalent DFA accepting the same language L.
- (b) Using pumping lemma to show that the language $L = \{a^n b^n c^n \mid n \geq 1\}$ 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	q_4	q_4

6. Attempt any *one* part of the following:

7 x 1 = 7

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

Dr. Rajesh Tewari
 / 15-May-2019 09:08:30 | 139.5.198.30