

**S.D.E.**  
**M.C.A. Sem - IV : SUMMER - 2019**  
**SUBJECT: THEORY OF AUTOMATA**

Day: Wednesday  
Date: 15/05/2019

Time: 02.00 PM TO 05.00 PM  
Max. Marks: 80

S-2019-5267

**N.B.:**

- 1) Attempt any **FIVE** questions from section –I and any **TWO** questions from Section –II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the section should be written in **~~SAME~~** answer book.

**SECTION-I**

**Q.1** Prove that regular sets are closed under union, concatenation and closure with an example. (10)

**Q.2** Convert NFA  $(\{p, q, r, s\}, \{0, 1\}, \delta, p, \{s\})$  To its equivalent DFA where  $\delta$  is shown in table. (10)

$\Sigma \backslash Q$	0	1
p	p, q	p
q	r	r
r	s	-
s	s	s

**Q.3** Prove that the language  $L = \{a^n b^{n+1} \mid n > 0\}$  is non-regular using pumping lemma. (10)

**Q.4** Write a Markov algorithm to find 1's complement of a given binary number. (10)

**Q.5** Find the CFL associated with the CFG given below (10)  
 $S \rightarrow Ab \mid ba \quad A \rightarrow a \mid aS \mid bAA \quad B \rightarrow b \mid bS \mid aBB.$

**Q.6** Explain Chomsky hierarchy of grammars in detail. (10)

**Q.7** Write short notes on: (10)  
i) Syntax Analysis                      ii) Acceptors and generators

**SECTION-II**

**Q.8** Design Turing machine which will find  $(a \bmod b)$  where a and b are integers. (15)

**Q.9** Define Push Down Automata. Describe the types of PDA. Explain the ways by which PDA recognizes the language. (15)

**Q.10** Construct Post Machine which accepts language (15)  
 $L = \{a^n b^m \mid n \geq 0, m \geq 0\}.$

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