

S.D.E.
M.C.A. Sem - IV : WINTER - 2018
SUBJECT: THEORY OF AUTOMATA

Day: Thursday
 Date: 06/12/2018

W-2018-4808

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

N.B.:

- 1) Attempt **ANY FIVE** questions from Section – I and attempt **ANY TWO** questions from section – II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to both the sections should be written in **SAPARATE** answer book.

SECTION - I

- Q.1** a) Prove that for all natural numbers n , $1 + 2 + 5 + \dots + (2n - 1) = n^2$. **(05)**
- b) Find the transitive Closure and the symmetric closure of the relation: **(05)**
 $R = \{(1, 2), (2, 3), (3, 4), (5, 4)\}$.
- Q.2** Design a Finite Automata that reads strings made up of the letters in the word 'CHARIOT' and recognizes those strings that contain the word 'CAT' as a substring. **(10)**
- Q.3** Construct DFA equivalent to NFA $M = [\{p, q, r, s\}, \{0, 1\}, \delta, p, \{q, s\}]$ **(10)**
 where δ is given in Table.

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

- Q.4** Prove that the set $L = \{0^i \mid i \text{ is an integer, } i \geq 1\}$, which consists of all strings of 0's whose length is a perfect square, is non regular. **(10)**
- Q.5** Convert the following right linear grammar G_R to its equivalent, left linear grammar G_L . **(10)**
 $S \rightarrow 0A$
 $A \rightarrow 10A \mid \epsilon$
- Q.6** Write the Markov algorithm to find the GCD of two given numbers. **(10)**
- Q.7** Write short notes on: **(10)**
 a) Pumping Lemma
 b) Regular Language and Regular Set

SECTION - II

- Q.8** Design a Turing Machine that recognizes binary palindromes. **(15)**
- Q.9** Design a PDA that checks for Well – formed parentheses. **(15)**
- Q.10** Construct a Post Machine that recognizes the following CFL **(15)**
 $L = \{a^n b^n \mid n \geq 0\}$

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