M.C.A. SEM - V (CHOICE BASED CREDIT SYSTEM 2011 & 2012 COURSE) : SUMMER - 2018

SUBJECT : FINITE AUTOMATA & GRAMMARS

Day : **Saturday** Time : **02.00 PM TO 5.00 PM**
Date : **28/04/2018** **S-2018-1801** Max. Marks : 100

N.B.:

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

SECTION – I

Q.1 **a)** Construct DFA for language which contains all string with exactly two consecutive zeros anywhere over $\Sigma = \{0, 1\}$ **[07]**

b) Convert the NFA $[\{p, q, r, s\}, \{0, 1\}, \delta, p, \{s\}]$ to its equivalent DFA, where the state transition function δ is shown in table: **[08]**

Q \ Σ	0	1
p	p, q	p
q	r	r
r	s	--
s	s	s

Q.2 **a)** Show that $L = \{a^p \mid p \text{ is prime}\}$ is non regular. **[07]**

b) Define Regular expression. Construct a Finite Automata equivalent to regular expression $(1^* + 0)^*$. **[08]**

Q.3 **a)** Find CFL associated with CFG **[07]**
$G = (\{S\}, \{a, b\}, P, S)$ where P is

$S \rightarrow aB \mid bA$
$A \rightarrow a \mid aS \mid bAA$
$B \rightarrow b \mid bS \mid aBB$

b) Convert the following CFG into GNF: **[08]**

$S \rightarrow AB \mid B$
$A \rightarrow a \mid aS \mid bAA$
$B \rightarrow b \mid bS \mid aBB$

Q.4 **a)** Simplify the following grammar: **[07]**

$S \rightarrow aS \mid AB$
$A \rightarrow a \mid \in$
$B \rightarrow b \mid \in$
$D \rightarrow b$

b) Prove that regular sets are closed under union, concatenation and closure with an example. **[08]**

P.T.O.

Q.5 **a)** Design an FSM for divisibility- by- 5 testers for decimal numbers. **[07]**

b) Design an FSM that reads strings made up of letters in the word 'CHARIOT' and recognizes those strings that contain the word 'CAT' as a substring. **[08]**

SECTION – II

Q.6 Define Pushdown automata. What are the different types of Pushdown automata? Construct a PDA that accepts the language over $\Sigma = \{a, b\}$ and is defined as $L = \{a^n b^n \mid n = 0, 1, 2, \ldots\ldots\}$. Simulate the working of this PDA for the inputs: **[20]**

a) aaabbb

b) aab

Q.7 Define the Turing machine, explain its working. Construct a TM that accepts the language $\{0^n 1^n 0^n \mid n \geq 1\}$ **[20]**

Q.8 **a)** Construct Finite Automata for regular expression $(ab)^* = (a + b)^* a * b$. **[10]**

b) Write the algorithm for minimization of automata. **[10]**

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