

**M.C.A. SEM - V (CHOICE BASED CREDIT SYSTEM 2011 &  
2012 COURSE ) : WINTER - 2017**  
**SUBJECT: FINITE AUTOMATA & GRAMMARS**

Day: **Saturday**  
Date: **11/11/2017**

Time: **02.00 PM TO 5.00 PM**  
Max. Marks: 100

**W-2017-1704**

**N.B.:**

- 1) Attempt any **FOUR** questions from Section –I and any **TWO** questions from Section –II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer book.
- 4) Use of non- programmable **CALCULATOR** is allowed.

**SECTION-I**

- Q.1** Design the finite Automata to check whether given decimal is divisible by four. (15)  
Verify your machine with suitable example.
- Q.2** Consider the Moore machine described by the transition table given below. (15)  
Construct corresponding mealy machine.

State	Next state		Output
	I/p = 0	I/p = 1	
→ q <sub>1</sub>	q <sub>1</sub>	q <sub>2</sub>	0
q <sub>2</sub>	q <sub>1</sub>	q <sub>3</sub>	0
q <sub>3</sub>	q <sub>1</sub>	q <sub>3</sub>	1

- Q.3** Define DFA and NFA. Convert NFA ( $\{p, q, r, s\}, \{0, 1\}, \delta, p, \{s\}$ ) to its equivalent DFA. Where  $\delta$  shown in the table. (15)

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

- Q.4** a) Describe the language consisting of all strings over  $\Sigma = \{0,1\}$  with at least 2 consecutive '0' s using regular expression. (05)  
b) Show that regular set is closed under union and intersection. (10)
- Q.5** Define CNF and convert the following CFG to CNF. (15)  
 $S \rightarrow aSa \mid bSb \mid a \mid b \mid aa \mid bb$
- Q.6** a) Show that  $L = \{a^n b^n \mid n \geq 1\}$  is non regular by using pumping lemma. (07)  
b) Write a note on Chomsky hierarchy. (08)

**SECTION-II**

- Q.7** Construct PDA accepting language consisting of even palindromes strings of 'a' s and 'b' s. (20)
- Q.8** Design a Turning Machine to find GCD of two given numbers. (20)
- Q.9** a) Describe the CFL generated by the following grammar G. (10)  
 $G = (\{S\}, \{a, b, \epsilon\}, P, S)$  where 'P' consists of  $S \rightarrow aSa \mid bSb \mid a \mid b \mid \epsilon$ .  
b) Draw NFA with  $\epsilon$  -moves for the regular expression  $(a^* + b^*)$ . (10)