Printed Pages: 02 **Sub Code: NCS402**

Paper Id: 110248 **Roll No.** | | | | | | | | | | |

B TECH

(SEM-IV) THEORY EXAMINATION 2018-19

THEORY OF AUTOMATA & FORMAL LANGUAGE

Time: 3 Hours ***Total Marks: 100***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a. Design a DFA for languages L containing strings of 0 and 1's where number of 0's is not divisible by 3.

b. Write regular expression for a language containing strings of 0's and 1's which does not end in '01'.

c. State and prove Arden's Theorem.

d. What are various applications of Finite Automata?

e. What do you mean by inherently ambiguous grammars? Explain.

f. Prove or disprove the following regarding regular expressions:

i. $(R+S)^* = R^* + S^*$

ii. $(RS+R)^* RS = (RR^*S)^*$

g. Write CFG for language L = $a^n b^n$ where n>=0. Also convert it into CNF.

h. Differentiate DPDA with NPDA.

i. Define Recursive and recursively enumerable language

j. Explain Post Correspondence Problem.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

a. Define NFA. What are various points of difference between NFA and DFA?

b. What are various points of difference between Moore & Mealy Machine? Explain the procedure to convert a moore machine into Mealy machine.

c. Define ambiguity. Show that the grammar G with following production is ambiguous.
S → a | aAb | abSb, A → aAAb | bS

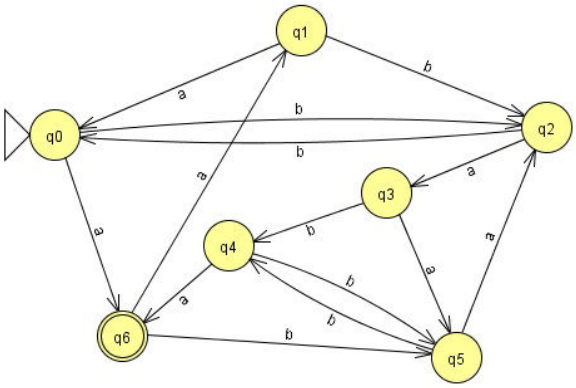
d. Construct a PDA M equivalent to grammar with following productions:
$S \rightarrow aAA$, $A \rightarrow aS / bS / a$
Also, check whether the string 'abaaaa' is in M or not.

e. Define PCP. Let A = {1, 110, 0111} and B = {111, 001, 11} and $\sum$ = {0, 1}. Find the solution of PCP.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

(a) Minimize the following Automata:

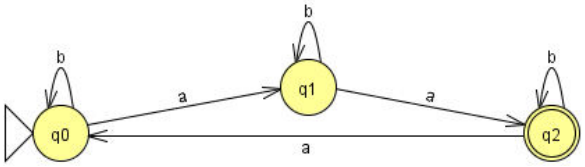


(b) Convert the following NFA $\{p,q,r,s\},\{0,1\},\delta,p,\{q,s\}$ into DFA where δ is given by

	0	1
→p	q, s	q
*q	r	q, r
R	s	p
*s	ϕ	p

4. Attempt any *one* part of the following: 10 x 1 = 10

(a) Find the regular expression of Given FA using Arden's theorem.



(b) Using pumping lemma for Regular languages prove that language $L = 0^{n^2}, n >= 1$ is not regular.

5. Attempt any *one* part of the following: 10 x 1 = 10

(a) Convert the following grammar in GNF: $S \rightarrow AB$, $A \rightarrow BS / a$, $B \rightarrow SA / b$

(b) Define derivation Tree. Show the derivation tree for string '*aabbbb'* with the following grammar S→AB/Є, A→aB, B→Sb.

6. Attempt any *one* part of the following: 10 x 1 = 10

(a) Design PDA for Language WcW^R, $W \in (a,b)*$

(b) Design a two stack PDA for the language $L = a^n b^m c^n d^m$ where $n,m \geq 1$

7. Attempt any *one* part of the following: 10 x 1 = 10

(a)	Design a Turing machine for language containing palindromes of a's and b's.
(b)	Write short note on any two: i. Properties of recursive & recursive enumerable languages. ii. Variants of Turing Machine. iii. Universal Turing Machine.