BTS-IV(SS)-02.20-0069 Reg. No. | | | | | | | | |

A

B.Tech. Degree IV Semester Special Supplementary Examination February 2020

CS 15-1404 AUTOMATA LANGUAGES AND COMPUTATIONS

(*2015 Scheme*)

Time: 3 Hours Maximum Marks: 60

PART A

(Answer *ALL* questions)

(10 × 2 = 20)

I. (a) Define Non deterministic Finite Automata. How is it different from Deterministic Finite Automata?

(b) Explain Moore and Mealy machines. Give an example for each.

(c) What are regular grammars? Give an example.

(d) What are context free grammars? Give a CFG to generate palindromes made of letters 'a' and 'b'.

(e) State the Pumping Lemma for regular sets. What is the lemma used to prove?

(f) Define a Push Down Automata (PDA).

(g) Explain the model of a Turing Machine.

(h) Explain Chomsky classification of languages.

(i) What are Context Sensitive Languages and Linear Bounded Automata?

(j) Explain the two normal forms of context free grammars.

PART B

(4 × 10 = 40)

II. (a) Convert the following NFA to equivalent DFA. (5)

	Next State	
Present State	a = 0	a = 1
→ A	A, B	C
B	B	A, C
C	A, D	B
D	D	D

Final state = D.

(b) Construct NFA for the following regular expression. (5)

(i) (111 + 000) 00 (ii) 0* + 1* + 2*

OR

III. (a) Prove that for every NFA there exits an equivalent DFA. (5)

(b) Construct a DFA to accept binary strings which have 00 or 11 as a substring. (5)

(P.T.O.)

IV. (a) What are regular expressions? Write regular expressions for the following language. (5)

(i) Binary strings starting with 0 and ending with 1
(ii) Binary strings having exactly two zeros's and any number of one's
(iii) Stings made of alphabets 'a' and 'b' having 'aba' as a substring
(iv) Binary strings having 4 bits
(v) Binary strings starting and ending with the same bit

(b) Using Ardens theorem, find the regular expression corresponding to the following automata. (5)

	Next State	
Present State	Input 0	Input 1
→ q1	q2	q3
q2	Φ	q1
q3	q1	ϕ

OR

V. (a) Using Pumping lemma show that the set of perfect squares in not a regular language. (5)

(b) Construct regular grammar for the following regular expressions. (5)

(i) aa*bb*cc* (ii) (0+1)*000(0+1)*

VI. (a) Convert the following grammar to Chomsky Normal Form (5)

$S \rightarrow aAB \mid b$

$A \rightarrow Ba \mid a$

$B \rightarrow aAB \mid b$

(b) Simplify the following CFG by removing epsilon symbols (5)

$S \rightarrow aAB \mid bX \mid \epsilon$

$A \rightarrow Ba \mid bSX \mid$

$B \rightarrow aAB \mid b \mid \epsilon$

$X \rightarrow a$

OR

VII. (a) Design a PDA to accept the language $L = \{a^n b^n \mid n >= 1\}$ by empty stack. (5)

(b) Construct an equivalent PDA for the following context free grammars. (5)

$S \rightarrow aB \mid bA$

$A \rightarrow aAB \mid bBB \mid a$

$B \rightarrow aS \mid bA \mid b$

VIII. (a) Design a turing machine to accept the language $L = \{a^n b^n \mid n >= 1\}$. (5)

(b) Explain multi-tape and multi-track turing machines. (5)

OR

IX. (a) Design a turing machine to accept the language (5)

$L(M) = \{ww^R \mid \text{where } |w| > 0\}$

(b) What is meant by Universal Turing machines? How can they solve any problem? (5)

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