

# Subject Code: BCS402 Roll No:

#### BTECH

## (SEM IV) THEORY EXAMINATION 2023-24 THEORY OF AUTOMATA AND FORMAL LANGUAGES

### TIME: 3 HRS

1.

**M.MARKS: 70** 

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

	SECTION A	
Attem	pt <i>all</i> questions in brief. $2 \ge 7 = 14$	
a.	Give the mathematical definition of DFA. Differentiate between NFA and DFA.	
b.	Construct Deterministic Finite Automata (DFA) to accept string that always ends with 101 over alphabet $\Sigma = \{0,1\}$	
c.	Give regular expressions that represent the language (L), which has all binary strings having two consecutive 0s and two consecutive 1s over the alphabet $\Sigma = \{0, 1\}$ .	
d.	Compute the Language generated by the given CFG G = ({S}, {a, b}, P, S} where P is defined by: $\{S \rightarrow SS, S \rightarrow ab, S \rightarrow ba, S \rightarrow \epsilon\}$	
e.	Let G be the grammar $S \rightarrow 0B \mid 1A$ $A \rightarrow 0 \mid 0S \mid 1AA$ $B \rightarrow 1 \mid 1S \mid 0BB$ Determine the leftmost derivation for the string 00110101	2.3
f.	Explain the concept of two stack PDA. Give an example of a language that is accepted by two stack PDA but not accepted by normal one stack PDA.	r P
g.	Explain Multi Tape Turing Machine.	]

## SECTION B

### 2.

	SECTION B
Atten	pt any <i>three</i> of the following: $7 \times 3 = 21$
a.	Construct a Finite automata (DFA) which accepts all binary numbers whose
	decimal equivalent is divisible by 4 over $\Sigma = \{0, 1\}$ .
b.	Compute the regular expression using Arden's Theorem for the following
	DFA.
	1
c.	Write an equivalent left linear grammar from the given right linear grammar.
	S→0A  1B
	A→0C  1A  0
	$B \rightarrow 1B  1A 1$
	C→0  0A
d.	Differentiate between DPDA and NPDA. Construct a PDA that accepts
	language L = { $a^n b^n \mid n \ge 1$ }.
e.	Differentiate between Deterministic Turing machine and Non-Deterministic
	Turing machine. Design a Turing machine for the language L={ww   w $\varepsilon$ (a +
	b)*}.

1 | Page



### BTECH (SEM IV) THEORY EXAMINATION 2023-24 THEORY OF AUTOMATA AND FORMAL LANGUAGES

#### **TIME: 3 HRS**

3.

4.

5.

6.

 $S \rightarrow 0S1 | A$  $A \rightarrow 1A0 | S | \varepsilon$  **M.MARKS: 70** 

## SECTION C



2	Ρ	а	g	е
---	---	---	---	---



Roll No:

# BTECH

(SEM IV) THEORY EXAMINATION 2023-24

# THEORY OF AUTOMATA AND FORMAL LANGUAGES

#### TIME: 3 HRS

7.

- M.MARKS: 70
- b. Find the equivalent CFG of the following PDA  $P = (\{q0, q1,\}, \{a, b\}, \{a, z0\}, \delta, q0, z0) \text{ where } \delta \text{ is given by:}$   $\delta (q0, a, z0) = (q0, az0)$   $\delta (q0, a, a) = (q1, aa)$   $\delta (q1, a, a) = (q1, \epsilon)$   $\delta (q1, \epsilon, z0) = (q1, \epsilon)$

Atten	npt any <i>one</i> part of the following: $7 \ge 1 = 7$		
a.	Construct Turing Machine that accepts language $L=\{a^{2n}b^n \mid n \ge 1\}$ . Als	0	
	show the instantaneous description for the string $w = aaaabb$ .		
b.	Explain the any two of the following:		
	i. Universal Turing Machine.		
	ii. Post Correspondence Problem.		
	iii. Recursive and recursively Enumerable Languages		

21-Aug202A 1:31:32 PM 147.55.242.132