



PAPER ID-410975

Printed Page: 1 of 2

Subject Code: KCA201

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

MCA
(SEM II) THEORY EXAMINATION 2023-24
THEORY OF AUTOMATA & FORMAL LANGUAGES

TIME: 3 HRS**M.MARKS: 100****Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.**

Qno.	Question	Marks	CO
a.	What do you mean by Formal languages?	2	1
b.	What do mean by acceptability of string?	2	1
c.	State the Kleen's Theorem.	2	2
d.	Write down the Closure properties of Regular Languages.	2	2
e.	Differentiate Right Linear and Left Linear grammars.	2	3
f.	What do you mean by simplification of CFG?	2	3
g.	What do you mean by ambiguity in CFG?	2	4
h.	Define Nondeterministic Pushdown Automata.	2	4
i.	Define Linear Bounded automata.	2	5
j.	What do you mean by Halting Problem?	2	5

SECTION B**2. Attempt any three of the following:**

a.	Convert the following Mealy machine into an equivalent Moore machine: Mealy Machine Transition Table <table><tr><th rowspan="3">PresentState</th><th colspan="4">NextState</th></tr><tr><th colspan="2">a = 0</th><th colspan="2">a = 1</th></tr><tr><th>State</th><th>Output</th><th>State</th><th>Output</th></tr><tr><td>→ q₀</td><td>q₂</td><td>0</td><td>q₁</td><td>0</td></tr><tr><td>q₁</td><td>q₀</td><td>1</td><td>q₃</td><td>0</td></tr><tr><td>q₂</td><td>q₁</td><td>1</td><td>q₀</td><td>1</td></tr><tr><td>q₃</td><td>q₃</td><td>1</td><td>q₂</td><td>0</td></tr></table>	PresentState	NextState				a = 0		a = 1		State	Output	State	Output	→ q ₀	q ₂	0	q ₁	0	q ₁	q ₀	1	q ₃	0	q ₂	q ₁	1	q ₀	1	q ₃	q ₃	1	q ₂	0	10	1
PresentState	NextState																																			
	a = 0		a = 1																																	
	State	Output	State	Output																																
→ q ₀	q ₂	0	q ₁	0																																
q ₁	q ₀	1	q ₃	0																																
q ₂	q ₁	1	q ₀	1																																
q ₃	q ₃	1	q ₂	0																																
b.	Explain the difference between Regular and Non-Regular Languages with suitable examples.	10	2																																	
c.	Find the derivation tree for the generating the string 11001010 from the following grammar: S → 1B 0A, A → 1 1S 0AA, B → 0 0S 1BB.	10	3																																	
d.	Construct the PDA to accept the following language: $L = \{a^{2n}b^n \text{ where } n > 0\}$.	10	4																																	
e.	What do you mean by Non-deterministic Turing Machine. Also construct a TM over {a, b} which contains a substring abb.	10	5																																	

SECTION C**3. Attempt any one part of the following:**

a.	Check whether the strings 00101 and 110010 are accepted or not by the following FA:	10	1
----	--	----	---



PAPER ID-410975

Printed Page: 2 of 2

Subject Code: KCA201

Roll No:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

MCA
(SEM II) THEORY EXAMINATION 2023-24
THEORY OF AUTOMATA & FORMAL LANGUAGES

TIME: 3 HRS**M.MARKS: 100**

b.	Convert the following ϵ – NFA to an equivalent DFA: 	10	1

4. Attempt any one part of the following:

a.	State and prove Arden's theorem.	10	2
b.	Construct an Finite Automata equivalent to the Regular expression given by: $R = (00 + 11)^* 11(0 + 1)^* 0$.	10	2

5. Attempt any one part of the following:

a.	Construct CFG for the regular expression: $R = (0 + 1)^* 01^*$	10	3
b.	Give the following CFG having S as start symbol, find an equivalent CFG with <i>no useless symbols</i> . $S \rightarrow AB \mid CA, A \rightarrow a, B \rightarrow BC \mid AB, C \rightarrow aB \mid b$	10	3

6. Attempt any one part of the following:

a.	Prove that the language: $L = \{a^{i^2} : \text{where } i \geq 1\}$ is <i>not context free</i> .	10	4
b.	Construct a PDA that accepts the language generated by the following grammar: $S \rightarrow aB, B \rightarrow bA \mid bA \rightarrow aB$.	10	4

7. Attempt any one part of the following:

a.	Design a TM for a set of all <i>strings with equal number of a and b</i> .	10	5
b.	Define recursive function. Prove that the function: $f(x) = \begin{cases} \frac{x}{2} & \text{if } x \text{ is even} \\ \frac{x-2}{2} & \text{if } x \text{ is odd} \end{cases}$	10	5