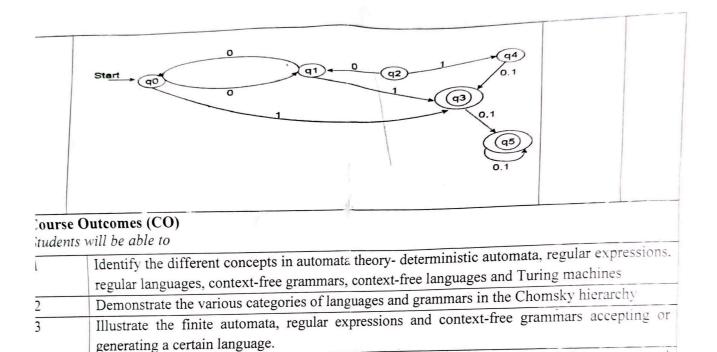
	Gu	iru Nanak Dev i	Engineering College, Ludh	iana		
Prog	gram	Department of	f Information Technology			
		B.Tech.(IT)	Semester	5 <sup>th</sup>		
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Vo.	rester Test (MST)	1	Course	Prof.	Rupinder Kau	ır
Max.	Marks		Coordinator(s)			
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ote	Attempt all questions		Kon I (unio			
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0.	Di	Quest			COs, RBT level	Marks
1			ositive with suitable exampl	e.	CO1, L2	2
2	Design a DFA for  w  r	nod 4=2 over alp	phabet set{ a, b}		CO4, L6	2
3	Articulate the followin	g Mealy machine	e into equivalent Moore mad	chine.	CO4, L3	4
	b	/1				
)4	Explain Chomsky Class				CO2, L1	4
	Consider a Non-determinto equivalent Determi		omata (NFA) and convert the omata (DFA).	nat NFA	CO1, L5	4
	a q	a,b	d1			
	q:	a,b b	q2			
					1	



Design finite automata, pushdown automata, Turing machines, formal languages. and

Utilize automata concepts and techniques in designing systems that address real world

4

grammars.

problems.

BT	Lower Order Thinking Levels (LOTS)			Higher Order Thinking Levels (HOTS			
lassification			1.2	Ι.4	1.5	1.6	
BT Level	L1	L2	L3	L4	L3	Lo	
umber		1.	Applying	Analyzina	Evoluation	0	
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ame							

Contrast the computational strengths and weaknesses of these machines

		Department of I	gineering College, Ludhia nformation Technology			
Program Subject Code		B.Tech.(IT)	Semester	5 <sup>th</sup>		
		PCIT-112	Subject Titl	T1	of Computa	tion
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	Marks	24	Time Duration	1 hour	30 minutes	
Date	of MST		Roll Number			
Note:	Attempt all questions					
Q. No.		Questio			COs, RBT level	Marks
21	List the applications o	f Context Free Gra	unmar		COI, L1	2
Q2	Is NDPDA more power	erful than DPDA?	Justify with suitable examp	ole.	CO5, L2	2
Q3	Explain ambiguity of language is ambiguou S -> S1S   0	Context free lang s or not.	uages. Test whether the fo	ollowing	CO5, L2	4
Q4	State Pumping Lemm L= { a <sup>p</sup>   p is prime } i		nmar. Show that the set		CO3, L3	4
Q5	Illustrate Arden's the expression.	corem. Convert the	e following automata into	regular	CO6, L4	4
					Tr.	1

[Total No. of Pages: 2.]

[Total No. of Questions: 09]

Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Theory of Computation

Subject Code: PCIT-112 Paper ID: 16443

Max. Marks: 60

Time Allowed: 03 Hours

NOTE:

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

Part - A

[Marks: 02 each]

Q1.

- a) Can you recall the different types of alphabets used in formal languages?
- b) Explain Chomsky's classification of languages and its significance.
- c) Compare and contrast the closure properties of different language classes.
- d) How are languages related in terms of inclusion and equality? Give examples to illustrate these relationships.
- e) Define the concept of acceptance by a Finite Automaton.
- State the pumping lemma for regular languages.

Part - B

[Marks: 04 each]

- Compare and contrast Moore and Mealy machines in terms of their structure and Q2. functionality.
- Design a Finite Automaton that recognizes a specific language described in words. Explain Q3. Arden's theorem in the context of regular grammars.
- Create a regular grammar for a language that accepts all strings over the alphabet {0, 1} that Q4. end with '01'. Convert the regular expression (0+1)\* into an equivalent finite automaton.
- Construct a finite automaton for a language that accepts strings with alternating '0's and '1's. Q5.

- Demonstrate the equivalence between DFA and NDFA for a specific language.
- Evaluate the limitations of Turing Machines in solving certain types of problems and discuss Q6. Q7. [Marks: 12 each] potential alternatives.

Part - C

Explain the Pumping Lemma and its significance in the theory of context-free languages. Develop a formal language that cannot be expressed by regular grammar and explain why. Q8.

OR

Provide an example of a language that can be accepted by a Pushdown Automaton. Evaluate the statement: "Pushdown Automata can recognize more languages than Finite Automata." Is this true or false?

- a) Create a set of closure properties for a novel language class and discuss its potential applications. Explain the concept of closure properties in the context of formal languages. Q9.
  - b) Break down the steps involved in solving the Halting problem and explain the challenges associated with it.

OR

- a) Critically evaluate the limitations of context-sensitive languages in terms of computational efficiency and practical implementation. How do these limitations impact the broader field of formal languages and automata theory?
- b) Propose a theoretical scenario where the Post Correspondence Problem can be utilized in a real-world application.

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		Department of Inf	neering College, Ludhi ormation Technology			
Progra	ım	B.Tech.(IT)	Semester	5 <sup>th</sup>		
Subject Code		PCIT-112	Subject Title	Theory	of Computa	tion
	emester Test (MST)	2	Course		der Kaur	
No.		-	Coordinator(s)			
Max. M	x. Marks 24 Time Duration 1 hou		1 hour	ur 30 minutes		
	f MST	15 <sup>th</sup> November, 2022	Roll Number	V - 2	1	
Note:	Attempt all questions					
Q. No.		Question			COs, RBT level	Marks
Q1	List the applications o	f Context Free Gram	mar		CO1, L1	2
Q2	Elaborate sentential fo	orm with suitable exa	mple	1 .	CO4, L2	2
Q3	Explain ambiguity of Context free languages. Test whether the following				CO5, L3	4
	language is ambiguou S -> S1S   0	s or not.				
Q4	State Pumping Lemma for Regular Grammar. Show that the set L= { a <sup>p</sup> · p is prime } is not regular.					4
Q5	Illustrate Arden's the expression.	eorem. Convert the	following automata into	regular	CO6, I.4	4
	50	,				
A		-	(5)			
	Please turn over page	e for Q6.			1 2	

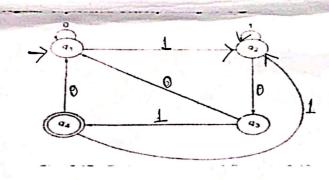
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Subje	ect Code Semester Test (MST)	PCIT-112	Subject Title Course		y of Computa Rupinder Kau	
Mid S	Semester Test (MST)	91.00	Coordinator(s)		10	
	Marks	24	Time Duration	1 hour	30 minutes	
Date o	of MST	29 Sep,2022	Roll Number			
Note:	Attempt all questions	F 4				,
Q. No.		Question			COs, RBT level	Marks
Q1	Distinguish Kleen Clo	sure and Kleen Posit	tive with suitable example	2	CO1, L1	2
Q2	Generate a regular exp	pression for  w  mod	4=2 over alphabet set { a ,	b }	CO3, L6	2
Q <u>3</u>	Differentiate Moore a both.	and Meally Machine	es along with valid diagr	rams of	CO4, L4	4
Q4 Q5	Explain Chomsky Cla	esification of Langue	ages in detail		CO2, L2	4
3. V		доа,ь	q1			
		a,b	q2		800	
		b		erminist	ic CO1, L6	8

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-		Department of I	nformation Technology			Tracked and Complete Complete Co
Pro	gram	B.Tech.(IT)	Semester	5 <sup>th</sup>		
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	. Marks	24	Time Duration	1 hour	30 minutes	
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Note	: Attempt all questions			ļ		
Q. No.	- 4. ·	Questio			COs, RBT level	Mark
QI	List the applications o	Context Free Grai	nmar		COI, LI	2
Q2	Is NDPDA more power	erful than DPDA? J	ustify with suitable examp	le.	CO5, L2	2
Q3	Explain ambiguity of Context free languages. Test whether the following language is ambiguous or not.  S -> S1S   0					
Q4	State Pumping Lemma	for Regular Gram	mar. Show that the set		CO3, L3	4

Illustrate Arden's theorem. Convert the following automata into regular CO6, L4



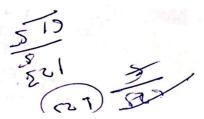
 $L = \{ a^p | p \text{ is prime } \} \text{ is not regular.}$ 

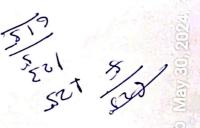
Q5

expression.

Q6 Define Greibach Normal Form. Convert the following Grammar into Greibach Normal Form (GNF):
S-> XA | BB, B-> SB | b, X->b, A-> a

· Samuel		Department of In	ncering College, Ludh formation Technology			
Prog	ram	B.Tech.(IT)	Semester	5 <sup>th</sup>	· 4	1 7 %
Subj	ect Code	PCIT-112	Subject Title	Theory	of Computa	tion
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	Marks	24	Time Duration	1 hour	30 minutes	11. 44
	of MST		Roll Number	1 2 4		171
	Attempt all questions					
Q. No.		Question			COs, RBT level	Marks
Q1	DistinguishKleen Clos	sure and Kleen Positi	ve with suitable examp	le.	CO1, L2	2
Q2	Design a DFA for  w	mod 4=2 over alphab	et set{a,b}	1,0	CO4, L6	2
Q3	Articulate the following	ng Mealy machine int	o equivalent Moore ma	chine.	CO4, L3	4
	a/1 b/0	q <sub>2</sub> a/1, b/1	$q_4$ $a/0$ $q_3$			
		b/1			CO2, L1	4
Q4	Explain Chomsky Clas	ssification of Langua	ges in detail.	hat NFA	CO1, L5	4
Q5	Consider a Non-determinto equivalent Determ	ninistic finite automa	la (141 11) with			
		a,b	b (q1)		* (	-
		a,b	a q2		- 17.	
Q6	Illustrate theneed for following Finite Auton		automata and mini	mize the	CO1, L4	8



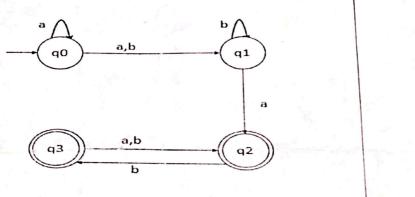


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100		Department of Inf	formation Technology			
Program		B.Tech.(IT)	Semester	5 <sup>th</sup>	· h	-
Subject Code		PCIT-112	Subject Title	Theory of Computation		
Mid Semo	ester Test (MST)	1	Course Coordinator(s)	Prof. Rupinder Kaur		
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Date of N	MST	29 Sep,2022	Roll Number	1	129	
Note: At	tempt all questions	· ·				
Q. No.		Question			COs, RBT level	Marks
$\frac{Q1}{}$	Distinguish Kleen Cl	osure and Kleen Posi	tive with suitable example	:	COI, LI	2
Q2	Generate a regular e	xpression for  w  mod	4=2 over alphabet set { a,	b }_	CO3, L6	2
Q <u>3</u>	Differentiate Moore both.	and Meally Machine	es along with valid diagr	ams of	CO4, L4	4
Ω4	Explain Chomsky C	Classification of Langu	ages in detail.		CO2, L2	4
Q5	Consider a Non-det	erministic finite auton erministic Finite Autor	nata (NFA) and convert the	nt NFA	CO4, L5	4
		а (q0a,b	q1	11 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		
	(	q3 ) a,b	q2			
Q6	Define need for mi Finite Automata	nimization and minir	nize the following Deter	ministic	CO1, L6	8
= - 1 2						7

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Program	B.Tech.(IT)	Semester	5 <sup>th</sup>		S)
Subject Code	PCIT-112	Subject Title	Theor	y of Computa	tion
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Max. Marks	24	Time Duration	1 hour	r 30 minutes	100
Date of MST	Roll Number				
Note: Attempt all questions	The second				-40
Q.	Questio	n		COs,	Marks

Q. No.	Attempt all questions  Question	COs, RBT level	Marks
210	DistinguishKleen Closure and Kleen Positive with suitable example.	CO1, L2	2
<u>Q2/</u>	Design a DFA for  w  mod 4=2 over alphabet set{ a, b}	CO4, L6	2
<b>3</b>	Articulate the following Mealy machine into equivalent Moore machine.	CO4, L3	4
	b/1		
QX.	Explain Chomsky Classification of Languages in detail.	CO2, L1	4
Q5,	Consider a Non-deterministic finite automata (NFA) and convert that NFA into equivalent Deterministic Finite Automata (DFA).	CO1, L5	4



Illustrate theneed for minimization of automata and minimize the CO1, L4 following Finite Automata:

[Total No. of Questions: 09]

[Total No. of Pages: 2.]

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Theory of Computation

**Subject Code: PCIT-112** Paper ID: 16443

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

[Marks: 02 each]

Q1.

- Can you recall the different types of alphabets used in formal languages?
- Explain Chomsky's classification of languages and its significance.
- Compare and contrast the closure properties of different language classes.
- How are languages related in terms of inclusion and equality? Give examples to illustrate these relationships.
- Define the concept of acceptance by a Finite Automaton.
- State the pumping lemma for regular languages.

Part - B

[Marks: 04 each]

- Compare and contrast Moore and Mealy machines in terms of their structure and Q2. functionality.
- Design a Finite Automaton that recognizes a specific language described in words. Explain Q3, Arden's theorem in the context of regular grammars.
- Create a regular grammar for a language that accepts all strings over the alphabet {0, 1} that ( Q4. end with '01'. Convert the regular expression (0+1)\* into an equivalent finite automaton.
  - Construct a finite automaton for a language that accepts strings with alternating '0's and '1's.

Page 1 of 2

Demonstrate the equivalence between DFA and NDFA for a specific language.

Evaluate the limitations of Turing Machines in solving certain types of problems and discuss

potential alternatives.

Part – C

[Marks: 12 each]

Q8. Explain the Pumping Lemma and its significance in the theory of context-free languages.

Develop a formal language that cannot be expressed by regular grammar and explain why.

OR

Provide an example of a language that can be accepted by a Pushdown Automaton. Evaluate the statement: "Pushdown Automata can recognize more languages than Finite Automata." Is this true or false?

Q9. a) Create a set of closure properties for a novel language class and discuss its potential applications. Explain the concept of closure properties in the context of formal languages.
b) Break down the steps involved in solving the Halting problem and explain the challenges associated with it.

OR

- a) Critically evaluate the limitations of context-sensitive languages in terms of computational efficiency and practical implementation. How do these limitations impact the broader field of formal languages and automata theory?
- b) Propose a theoretical scenario where the Post Correspondence Problem can be utilized in a real-world application.

Page 2 of 2

[Total No. of Questions: 09]

Uni. Roll No.

[Total No. of Pages: 02]

Program: B.Tech. (Batch 2018 onward)

MORNING

Semester:5th

0 9 MAY 2023

Name of Subject: Theory of Computation

Subject Code: PCIT-112

Paper ID: 16443

Scientific calculator is NotAllowed

Time Allowed: 03 Hours

Max. Marks: 60

## NOTE:

1) Parts A and B are compulsory

- 2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
- 3) Any missing data may be assumed appropriately

## Part - A

[Marks: 02 each]

Q1.

- a) List the applications of Context Free Grammar.
- b) Explain Left -most derivation and right- most derivation tree along with suitable diagram.
- c) Articulate grammar for set of all strings starting and ending with different symbol over alphabet set {a, b}.
- d) Demonstrate Chomsky Normal Form with example.
- e) Is NDPDA more powerful than DPDA? Justify.
- f) Differentiate Kleen Star and Kleen Positive.

## Part - B

[Marks: 04 each]

- Q2. List the properties of LR (k) Grammar.
- Q3. Discuss in detail model of finite automata.
- Explain Halting Problem of Turing Machine. Q4.
- Q5. Differentiate Moore and Mealy Machines.
- Design a PDA for odd number of palindromes. Q6.

## Page 1 of 2

Part - C

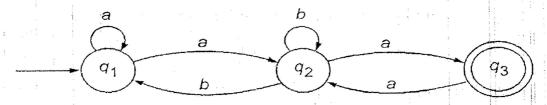
[Marks: 12 each]

**Q8.** Describe Chomsky Classification of Languages in detail.

OR

State Pumping Lemma for regular languages. Show that  $L=\{a^p \mid where \ p \text{ is prime}\}$  is not regular.

**Q9.** Construct a regular expression corresponding to the automata given using Arden's Theorem:



OR

Formulate a grammar in Greibach Normal Form equivalent to grammar:

$$S \rightarrow AA \mid a$$

$$A \rightarrow SS \mid b$$

\*\*\*\*\*\*

[Total No. of Questions: 09]

[Total No. of Pages: 02]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

**EVENING** 

Name of Subject: Theory of Computation

0 4 JAN 2023

Subject Code: PCIT-112

Paper ID: 16443

Time Allowed: 03 Hours

Max. Marks: 60

## NOTE:

1) Parts A and B are compulsory

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

Part - A

[Marks: 02 each]

Q1.

- a) Differentiate between Pushdown Automata and Turing Machine.
- b) Describe the Recursively Enumerable Language with example.
- c) Prove that for any transition function  $\delta$  and for any two input strings x and y,  $\delta(q, xy) = \delta(\delta(q, x), y)$
- d) Let L be the set of all palindromes over {a,b}. Construct a grammar G generating L.
- e) Let  $G = (\{S, A1\}, \{0,1,2\}, P, S)$  where P consists of  $S \to 0SA_12$ ,  $S \to 012$ ,  $2A_1 \to A_12$ ,  $1A_1 \to 11$ Find L(G).
- f) Prove that following regular expressions are equivalent.

$$aa(b^* + a) + a(ab^* + aa) = aa(b^* + a)$$

Part - B

[Marks: 04 each]

- How Noam Chomsky classified the formal languages? Discuss each class with the help of Q2. suitable examples. Also name the automata accepting these languages.
- Q3. Discuss in detail Linear Bounded Automata.
- State and prove pumping lemma for regular grammars. Q4.

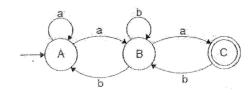
Q5. Given the grammar  $S \to AB$ ,  $A \to a$ ,  $B \to C \mid b$ ,  $C \to D$ ,  $D \to E$ ,  $E \to a$ , find an equivalent grammar which is reduced and has no unit productions.

EVENING 0 4 JAN 2023

Q6. Construct a minimum state automaton equivalent to Finite Automata given below:

STATE	INPUT		
	a	b	
<b>-▶</b> q0	q <sub>1</sub>	<u>q2</u>	
qı	<b>Q</b> 4	<u>q</u> 3	
<b>q</b> <sub>2</sub>	q4	q <sub>3</sub>	
(q <sub>3</sub> )	<b>q</b> 5	<b>q</b> 6	
(94)	<b>q</b> 7	<b>q</b> 6	
q <sub>5</sub>	Q3	<u>q</u> 6	
<b>q</b> 6	<b>q</b> 6	96	
. Q7	<b>Q</b> 4	96	

Q7. Derive the regular expression of given automaton using Arden's Theorem.



Part - C

[Marks: 12 each]

Q8. Describe and highlight the points that differentiate a mealy machine from a moore machine. Illustrate using an example, the conversion of moore machine to mealy machine.

OR

Discuss in detail the procedure to convert context free grammar into Greibach Normal Form. Also apply the discussed procedure to convert the following CFG into GNF

$$s \to AB$$
,  $A \to BS|b$ ,  $B \to SA|a$ 

Q9. What is the difference between PDA acceptance by empty stack and final state? Design a PDA to accept the language  $L = \{\omega 2\omega | \omega \varepsilon \{0,1\}^*\}$  by final state.

OR

Design a Turing machine M to recognize the language  $\{1^n 2^n 3^n | n \ge 1\}$ . Obtain the computation sequence of M for processing the input string 112233.

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## EVENING

[Total No. of Questions: 09]

[Total No. of Pages: 2]

10 JUN 20123

Program: B.Tech. (Batch 2018 onward)

Semester: 5<sup>th</sup> Sem

Name of Subject: Theory of Computation

Subject Code: PCIT-112

Paper ID: 16443

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Time Allowed: 03 Hours

Max. Marks: 60

## NOTE:

1) Parts A and B are compulsory

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

## Part - A

[Marks: 02 each]

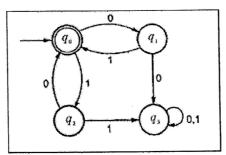
Q1.

- a) Comment on TOC in area of computer science.
- b) List the basic Symbols used in formal language.
- c) Compare Moore and meally machines example.
- d) List the Closure properties of language classes.
- e) Construct a Finite Automata for the regular expression ((a+b)(a+b))\*.
- f) If L is a language accepted by a nondeterministic finite automation, then a deterministric finite automation exists accepting L. Discuss.

## Part - B

[Marks: 04 each]

- Q2. Define finite state machine in TOC? Construct Finite State Machine as Processing input.
- Q3. Compare Kleen Closure and Kleen Positive with suitable example.
- Q4. Define Halting Problem. Comment on ATM =  $\{(M, w) \mid M \text{ is a TM and M halts at input } w \}$ .
- Q5. Construct RE for given finite automata with Arden's theorem.



# EVENING

# 10 JUN 2023

Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

- Q6. Construct NFA and convert it to it's equivalent DFA for the regular expression  $1(1+10)^* + 10(0+01)^*$
- Q7. Construct a grammar in Greibach Normal Form equivalent to grammar

$$A \rightarrow SS \mid b$$

Part - C

[Marks: 12 each]

Q8. Design a Turing machine to add two given integers. Construct Turing machine for  $1 = \{a^n b^m a^{(n+m)} \mid n,m \ge 1\}$ 

OR

Construct Pushdown automata for  $L = \{0^m 1^{(n+m)} 2^n \mid m,n \ge 0\}$ 

Q9. Compare linear bounded automata and context sensitive language.

OR

- a) Explain Pumping Lemmas and its types.
- b) Discuss Chomsky Classification of Grammars.

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## EVENING

[Total No. of Questions: 09]

1 4 DEC 2023 [Total No. of Pages: 2.]

Uni. Roll No. ....

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Theory of Computation

Subject Code: PCIT-112

Paper ID: 16443

Time Allowed: 03 Hours

Max. Marks: 60

#### NOTE:

1) Parts A and B are compulsory

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

Part - A

[Marks: 02 each]

01.

- a) Can you recall the different types of alphabets used in formal languages?
- b) Explain Chomsky's classification of languages and its significance.
- c) Compare and contrast the closure properties of different language classes.
- How are languages related in terms of inclusion and equality? Give examples to illustrate these relationships.
- e) Define the concept of acceptance by a Finite Automaton.
- f) State the pumping lemma for regular languages.

Part - B

[Marks: 04 each]

- Q2. Compare and contrast Moore and Mealy machines in terms of their structure and functionality.
- Q3. Design a Finite Automaton that recognizes a specific language described in words. Explain Arden's theorem in the context of regular grammars.
- Q4. Create a regular grammar for a language that accepts all strings over the alphabet {0, 1} that end with '01'. Convert the regular expression (0+1)\* into an equivalent finite automaton.
- Q5. Construct a finite automaton for a language that accepts strings with alternating '0's and '1's.

Page 1 of 2

## **EVENING**

## 1 4 DEC 2023

- Q6. Demonstrate the equivalence between DFA and NDFA for a specific language.
- Q7. Evaluate the limitations of Turing Machines in solving certain types of problems and discuss potential alternatives.

Part - C

[Marks: 12 each]

Q8. Explain the Pumping Lemma and its significance in the theory of context-free languages.
Develop a formal language that cannot be expressed by regular grammar and explain why.

OR

Provide an example of a language that can be accepted by a Pushdown Automaton. Evaluate the statement: "Pushdown Automata can recognize more languages than Finite Automata." Is this true or false?

- Q9. a) Create a set of closure properties for a novel language class and discuss its potential applications. Explain the concept of closure properties in the context of formal languages.
  - b) Break down the steps involved in solving the Halting problem and explain the challenges associated with it.

#### OR

- a) Critically evaluate the limitations of context-sensitive languages in terms of computational efficiency and practical implementation. How do these limitations impact the broader field of formal languages and automata theory?
- b) Propose a theoretical scenario where the Post Correspondence Problem can be utilized in a real-world application.

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#### MORNING

[Total No. of Questions: 09] Uni. Roll No. .....

2 7 FEB 2024

[Total No. of Pages: 02]

Program: B.Tech. (Batch 2018 onward)

Semester: 5th

Name of Subject: Theory of Computation

Subject Code: PCIT-112

Paper ID: 16443

Scientific calculator is not Allowed

Time Allowed: 03 Hours

Max. Marks: 60

## NOTE:

1) Parts A and B are compulsory

2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice

3) Any missing data may be assumed appropriately

Part - A

[Marks: 02 each]

Q1.

- a) Distinguish Kleen Star and Kleen Positive with suitable example.
- b) Is NDPDA more powerful than DPDA? Justify.
- c) Design a DFA for |w| mod 4=2 over alphabet set {a, b}
- d) Elaborate Sentential form.
- e) Articulate grammar for set of all strings starting and ending with different symbol over alphabet set {a, b}.
- f) Discuss Multi-tape Turing Machine.

Part - B

[Marks: 04 each]

- Q2. Differentiate Moore and Mealy Machines.
- Q3. Describe Chomsky Classification of Languages in detail.
- Q4. Design a PDA for odd number of palindromes.
- Q5. State Pumping Lemma for regular languages. Show that L= {ap | where p is prime} is not regular.
- Q6. Compare and Contrast Push Down Automata with Turing Machine.

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2 7 FEB 2024

Q7. Design model of Finite Automata with suitable diagram

Part - C

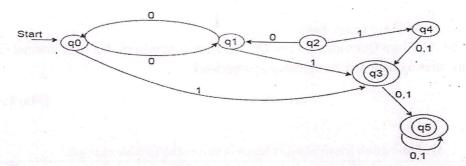
[Marks: 12 each]

Q8. Formulate a grammar in Greibach Normal Form equivalent to grammar:

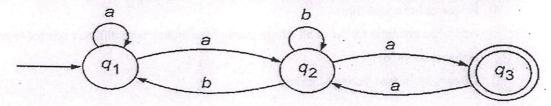
$$A \rightarrow SS \mid b$$

OR

Illustrate the need for minimization of automata and minimize the following Finite Automata:



Q9. Construct a regular expression corresponding to the automata given using Arden's Theorem:



OR

Explain Post Correspondence Problem of Turing Machine.

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[Marks: 02 each]

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- d) Elaborate Sentential form.
- e) Articulate grammar for set of all strings starting and ending with different symbol over alphabet set {a, b}.
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## Part - B

[Marks: 04 each]

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- Q4. Design a PDA for odd number of palindromes.
- Q5. State Pumping Lemma for regular languages. Show that L= {a<sup>p</sup> |where p is prime} is not regular.
- Q6. Compare and Contrast Push Down Automata with Turing Machine.

## Page 1 of 2

# **EVENING**

# 0 5 JUN 2024

Q7. Design model of Finite Automata with suitable diagram

Part - C

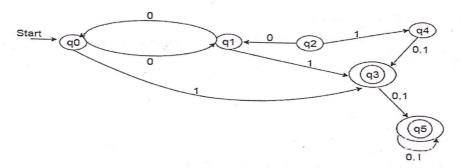
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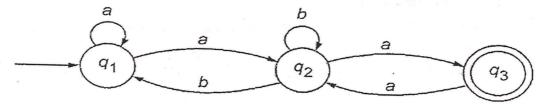
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