Printed page:02	Subject Code: ACSE0404/ACSEH0404/AMICSE040
	Roll No.

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA (An Autonomous Institute)

Affiliated to Dr. A.P. J. Abdul Kalam Technical University, Uttar Pradesh, Lucknow
Course:B.Tech/M.Tec(Int.)
Branch:CSE/CSE-R/M.Tech(Int.)/AI/AIML/DS/IOT/CY/CS/IT
Semester: IV
Sessional Examination:3rd

Subject Name: Theory of Automata & Formal Languages Year- (2023-2024)

Time: 1.15Hours

Max. Marks:30

General Instructions:

- ➤ This Question paper consists of 2 pages & 5 questions. It comprises three Sections -A, B, &C. You are expected to answer them as directed.
- Section A-Q.No 1 isof one 1 mark each &Q.No 2 carries 2 markseach.
- > Section B.Q. No- 3 carries 5 marks each. Attempt any two parts

sequence of input string.

d) All are correct

> Section C.Q.No4 & Scarries 6 marks each Attempt any one part a orb

1.	All	SECTION – A questions are compulsory-		Iarks] 1=4)	
	2.	Identify a unit production.	(1)	CO3	
	a.	1) A→B	(-)	000	4
		2) A→aB			
		3) A→Bb			
		4) A→a			
	b.	Push down automata acceptslanguages.	(1)	CO4	
		1) Type-3			
		2) Type -2			
		3) Type-1			
		4) Type-0			
	c.	PDA is more powerful than	(1)	CO4	
		a) Turing machine			
		b) Finite automata			
		c) Both (a) and(b)			
		d) None of these			
	d.	Choose correct option regarding, Turing machine is more powerful than Finite automata.	(1)	CO5	
		a) Turing machine head movement is continued to one direction.b) Turing machine head moment is in no directions			
		c) Turing machine head moment is in no directions c) Turing machine has capability to remember arbitrary long			
		c) Taring machine has capability to remember arbitrary long			

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2.	All	questions are compulsory-	Ox	2=4)
	a.	Difference between DPDA and NPDA.		CO3
	b.	Discuss Basic Model of Turing Machine.	. ,	CO5
		SECTION - B	' '	larks
3.		swer any two of the following-	•	5=10)
	a.	Let G be the grammar $S \rightarrow aB \mid bA$, $A \rightarrow a \mid aS \mid bAA$, $B \rightarrow b \mid bS \mid$		CO3
		aBB. For the string "aaabbabbba", find	(0)	000
		a)Parse tree		
		b)Leftmost derivation		
		c)Rightmost derivation		
	b.	Describe Context Free Grammar (CFG). Convert the following	(5)	CO3
		grammar into CNF: S→aAbB, A→aA, B→bB b		
	c.	Convert the grammar: S→aAA, A →a aS bS to a PDA that accepts	(5)	CO4
		the same language by empty stack.		
		SECTION - C	[12]V	[arks]
- 4	An	swer any one of the following-	(1×	6=6)
	a.	State Pumping Lemma theorem for regular languages. Show that	10	CO3
			(6)	
		the language L= {a'b' j=i ² } is not Context Free Language.	(0)	000
	b.	the language $L = \{a^ib^j \mid j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m \mid n,m>=1\}$	(6)	CO4
	b.	the language L= {a'b' j=i ² } is not Context Free Language.	,,	
5.		the language $L = \{a^ib^i \mid j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^mb^nc^m \mid n,m \ge 1\}$	(6)	
5.		the language $L = \{a^ib^i j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m n,m>=1\}$ aswer any one of the following-	(6) (1×	CO4
5.	Aı	the language $L = \{a^nb^i j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m n,m>=1\}$ aswer any one of the following- Design a Turing Machine for the Language $L = \{a^nb^n n>=0\}$	(6) (1× (6)	CO4 6=6) CO5
5.	Ai a.	the language $L = \{a^ib^i j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m n,m>=1\}$ aswer any one of the following-	(6) (1×	CO4
5.	Ai a.	the language $L = \{a^tb^t j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m n,m>=1\}$ aswer any one of the following- Design a Turing Machine for the Language $L = \{a^nb^n n>=0\}$ Write Short note on any two of the following:	(6) (1× (6)	CO4 6=6) CO5
5.	Ai a.	the language L= {a'b' j=i²} is not Context Free Language. Construct a PDA for the language L={a''b''c'' n,m>=1} aswer any one of the following- Design a Turing Machine for the Language L={ a''b'' n>=0} Write Short note on any two of the following: 1) Universal Turing Machine	(6) (1× (6)	CO4 6=6) CO5

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sequence of input string. d) All are correct

> Section C.Q.No.4 & Scarries 6 marks each Attempt any one part a orb

1. A	SECTION – A Il questions are compulsory-		[arks] 1=4)
a.	Identify a unit production. 1) A→B 2) A→aB 3) A→Bb 4) A→a	(1)	CO3
b.		(1)	CO4
c.	PDA is more powerful than a) Turing machine b) Finite automata c) Both (a) and (b) d) None of these	(1)	CO4
d.	Choose correct option regarding, Turing machine is more powerful than Finite automata. a) Turing machine head movement is continued to one direction. b) Turing machine head moment is in no directions. c) Turing machine has capability to remember arbitrary long.	(1)	CO5

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2 All questions

4.	AI	questions are compulsory-	(2×	2=4)
	a.	Difference between DPDA and NPDA.	(2)	,
	b.	Discuss Basic Model of Turing Machine.	(2)	CO5
		SECTION - B	, ,	[arks]
3.	An	swer any two of the following-		
	a.	Let G be the grammar $S \rightarrow aB \mid bA$, $A \rightarrow a \mid aS \mid bAA$, $B \rightarrow b \mid bS \mid$		=10)
		aBB. For the string "aaabbabbba", find	(5)	CO3
		a)Parse tree		
		b)Leftmost derivation		
		c)Rightmost derivation		
	b.	Describe Context Free Grammar (CFG). Convert the following	(5)	CO3
		grammar into CNF: S→aAbB, A→aA, B→bB b.	(0)	000
	c.	Convert the grammar: S→aAA, A →a aS bS to a PDA that accepts	(5)	CO4
		the same language by empty stack.	()	
		SECTION - C		
		SECTION-C	[12N	Tarks]
- 4	An	swer any one of the following-		farks] 6=6)
- 4	An			,
- 4	An a.	swer any one of the following- State Pumping Lemma theorem for regular languages. Show that	(1×	6=6)
-4				,
- 4		swer any one of the following- State Pumping Lemma theorem for regular languages. Show that	(1×	6=6)
-4	a.	swer any one of the following- State Pumping Lemma theorem for regular languages. Show that the language $L = \{a^ib^j \mid j=i^2\}$ is not Context Free Language.	(1×	6=6) CO3
5.	a. b.	swer any one of the following- $ \label{eq:continuous} $	(1× (6) (6)	CO3
	a. b.	Swer any one of the following- $ State \ Pumping \ Lemma \ theorem \ for \ regular \ languages. \ Show that the language \ L=\{a^ib^i j=i^2\} \ is \ not \ Context \ Free \ Language. \\ Construct \ a \ PDA \ for \ the \ language \ L=\{a^nb^nc^m n,m>=1\} $ aswer any one of the following-	(1× (6) (6) (1×	CO3 CO4 6=6)
	a. b. Ar a.	State Pumping Lemma theorem for regular languages. Show that the language $L = \{a^ib^j \mid j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m \mid n,m>=1\}$ aswer any one of the following-Design a Turing Machine for the Language $L = \{a^nb^n n>=0\}$	(1× (6) (6) (1× (6)	CO3 CO4 6=6) CO5
	a. b.	State Pumping Lemma theorem for regular languages. Show that the language $L = \{a^ib^j \mid j=i^2\}$ is not Context Free Language. Construct a PDA for the language $L = \{a^nb^nc^m \mid n,m>=1\}$ aswer any one of the following-Design a Turing Machine for the Language $L = \{a^nb^n n>=0\}$ Write Short note on any two of the following:	(1× (6) (6) (1×	CO3 CO4 6=6)
	a. b. Ar a.	State Pumping Lemma theorem for regular languages. Show that the language L= {aibi j=i²} is not Context Free Language. Construct a PDA for the language L={anbncm n,m>=1} aswer any one of the following- Design a Turing Machine for the Language L={anbncm n,m>=0} Write Short note on any two of the following: 1) Universal Turing Machine	(1× (6) (6) (1× (6)	CO3 CO4 6=6) CO5
	a. b. Ar a.	State Pumping Lemma theorem for regular languages. Show that the language L= {aibi j=i²} is not Context Free Language. Construct a PDA for the language L={anbncm n,m>=1} aswer any one of the following- Design a Turing Machine for the Language L={anbncm n,m>=0} Write Short note on any two of the following: 1) Universal Turing Machine	(1× (6) (6) (1× (6)	CO3 CO4 6=6) CO5